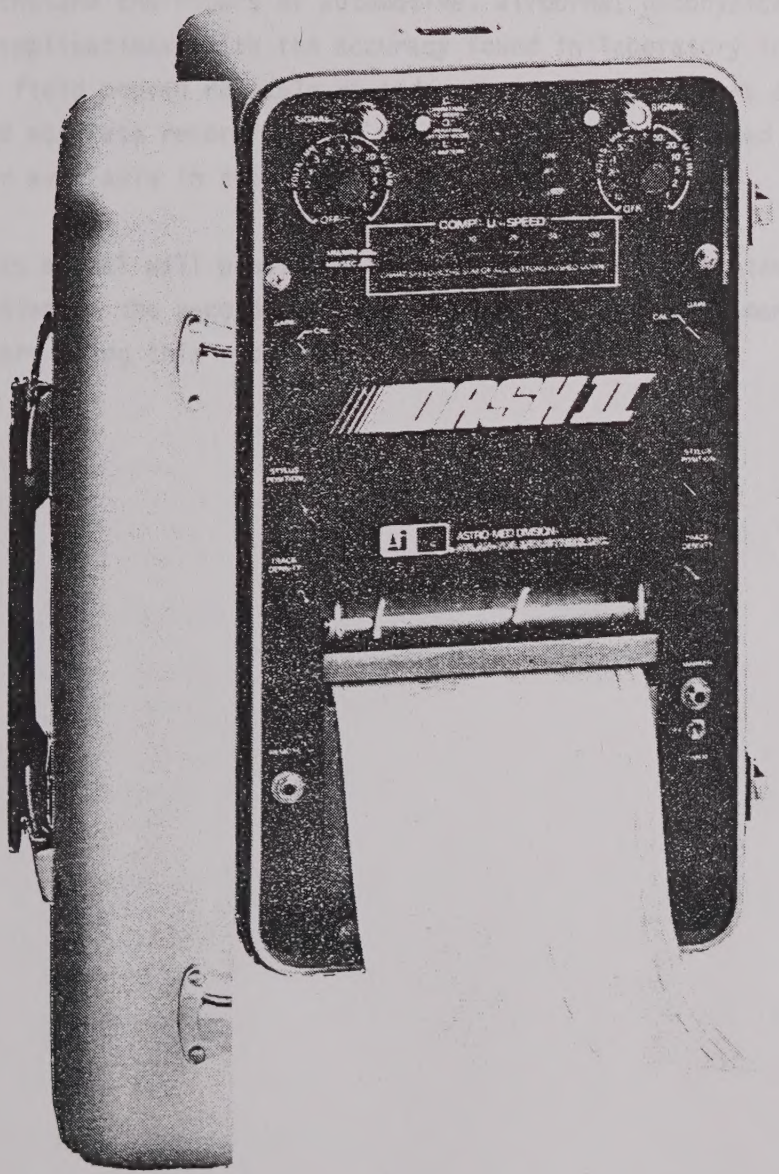
Astro-Med
two-channel field recorder
DASH II

MOD 111



INTRODUCTION

The Astro-Med Dash II represents an outstanding combination of performance and reliability in thermal trace chart recorders. It is a highly sophisticated recorder featuring PATHFINDER™ position feedback galvanometers for recording data in the range of DC to over 100 hertz inklessly on low cost heat sensitive paper. It's rugged construction will withstand the rigors of automotive, airborne, geophysical and marine applications, with the accuracy found in laboratory instruments. It is a field proven reliable recorder that will give years of trouble-free and accurate recording. We consider it the most rugged chart recorder available in the industry.

This manual will provide information on the use, maintenance and calibration of the recorder. We trust that you will have many productive years using this recorder.

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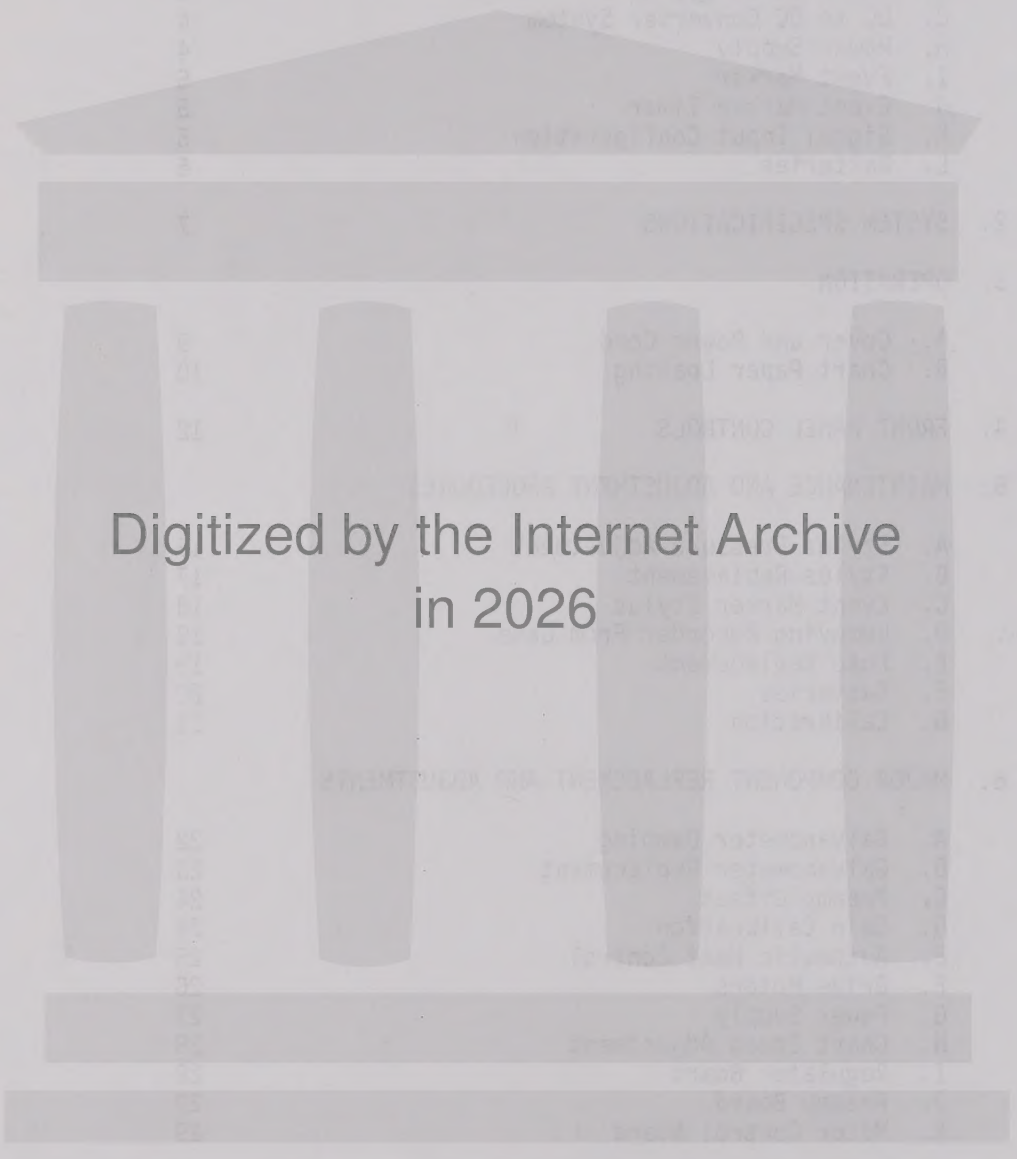
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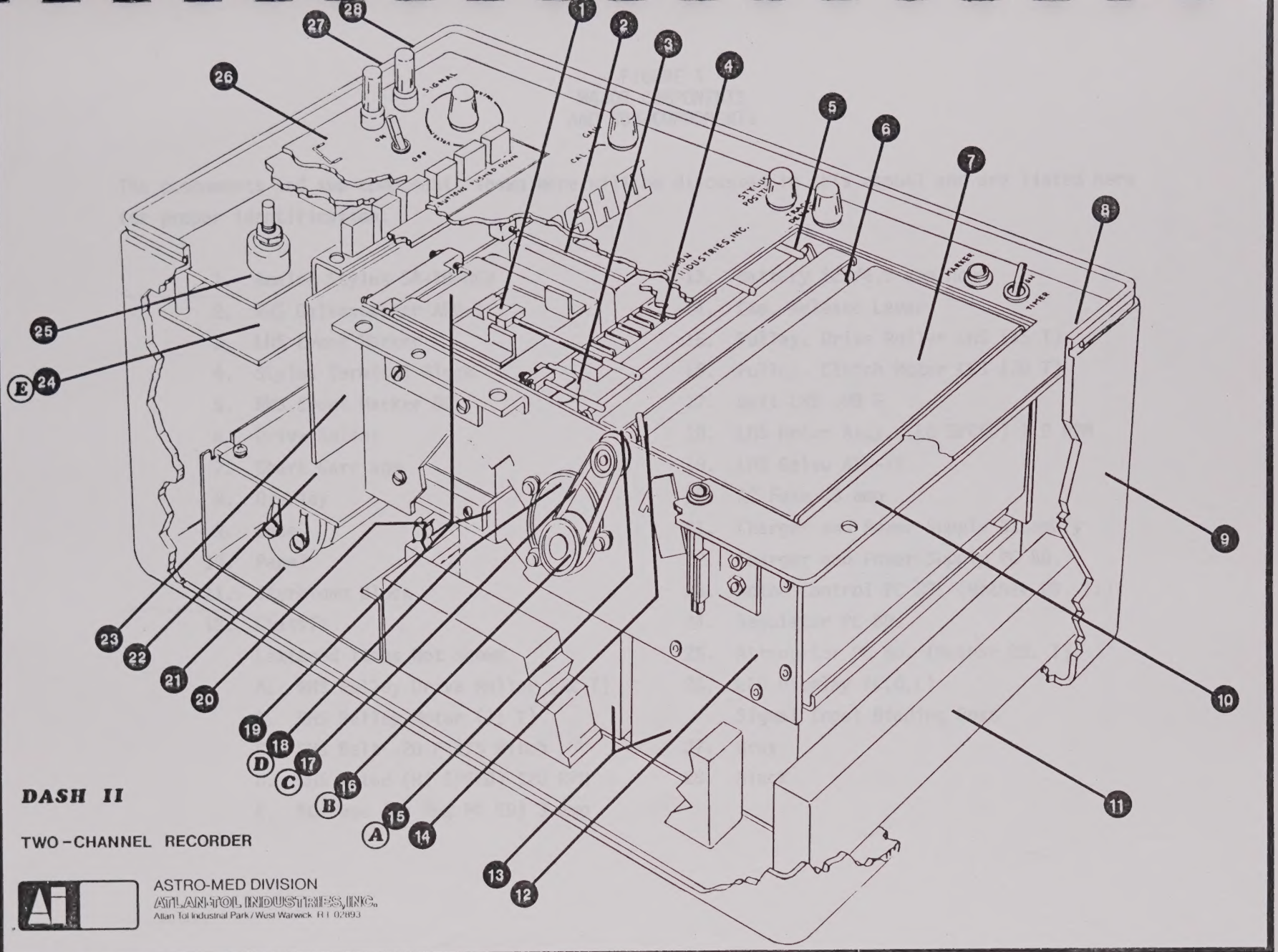


DASH II

TWO-CHANNEL RECORDER

ASTRO-MED DIVISION
ATLANTOL INDUSTRIES, INC.
Allan Tol Industrial Park / West Warwick R.I. 02893

FIGURE 1
MAJOR COMPONENTS
AND SUB-COMPONENTS

The components and sub-components shown here will be discussed in this manual and are listed here for proper identification.

1. Analog Stylus SA-10-DCH
2. RHS Galvanometer AFG-1
3. LHS Event Marker
4. Stylus Terminal Block
5. RHS Event Marker DC
6. Drive Roller
7. Chart Carriage
8. Overlay
9. Case
10. Panel
11. Styrofoam Block
12. Chassis

Lettered Items Not Shown

A. RHS Pulley Drive Roller (12 T)
B. RHS Pulley Motor (11 T)
C. RHS Belt .20 P 1/5 Pitch
D. RHS Motor (HI SPEED) 120 RPM
E. DC Fuse (on Reg PC BD) 3 amp

13. Battery 12V/4.5 amp/hour
14. Cap, Release Lever
15. Pulley, Drive Roller LHS (15 T)
16. Pulley, Clutch Motor LHS (30 T)
17. Belt LHS .08 P
18. LHS Motor Assy. (LO SPEED) 1.2 RPM
19. LHS Galvo AFG-12
20. AC Fuse .5 amp
21. Charger and Power Supply Assembly
22. Charger and Power Supply PC BD.
23. Motor Control PC BD. (Mother BD. II)
24. Regulator PC BD.
25. Attenuator PC BD. (Mother BD. I)
26. LED Display (C,O,L)
    Signal Input Binding Post
27. Gray
28. Black

1. GENERAL DESCRIPTION

The DASH II is a portable, totally self-contained battery or line powered two channel recording system, with two event markers, internal timer, and remote chart drive capability.

It contains an integral charger and power supply which has sufficient capacity to operate the DASH II from AC line power and simultaneously charge the two gel-type batteries. A front panel indicator continually shows battery condition and acts as a pilot lamp to show that the recorder is turned on.

The DASH II has an impressive choice of 32 chart speeds. Astro-Med's "Comp-U-Speed" chart drive system offers speeds from 5 mm/minute to over 100 mm/second. Unlike ink, its thermal writing system requires no cleaning or maintenance, even after weeks or months on the shelf. Stylus heat control is automatically adjusted to choice of chart speed for uniform line quality.

The recorder also features PATHFINDER position feedback galvanometers for recording data in the range of DC to over 100 hertz inklessly on thermal sensitive paper.

A. BASIC CHASSIS

The chassis of this recorder is ruggedly constructed, utilizing anodized aluminum and stainless steel members. Precision ball bearings, as well as oilite bushings are used to minimize wear. The bottom portion of the case easily slips off the main frame and exposes a completely modular chassis for easy accessibility.

B. WRITING SYSTEM

The recorder writes by a heated stylus on thermal sensitive chart paper. Application of heat to the chemically treated paper causes it to produce a clear trace that will not smear or run. Depending on choice of paper, the color can be blue or black.

C. GALVANOMETER

The high response and accuracy of the DASH II is made possible by its unique PATHFINDER position feedback galvanometer transducer and a servo amplifier, both built into the galvanometer. The transducer senses the position of the moving coil of the galvanometer and constantly feeds back a correction signal to the integral servo amplifier. As a result, the galvanometer has an overall accuracy of better than 1% full scale and a frequency response from DC to 30Hz full scale and over 200Hz at reduced amplitudes. The galvanometer is a very "stiff" or high torque device which has all of the power necessary to move the stylus over the 50 mm wide channel at high speeds with accurate reproduction of the input signal.

D. PREAMP ELECTRONICS

In addition to the basic drive amplifier incorporated within the galvanometer, it is assisted by a preamplifier which increases the response sensitivity to 1 mv/mm.

E. EDGE WRITING STYLUS

The Astro-Med stylus is an extremely rugged writing instrument designed to operate from 12 VDC power with minimal power consumption. There are no delicate members to the stylus assembly and therefore it is not prone to damage during recording, chart loading, or field handling.

F. CHART DRIVE SYSTEM

The Comp-U-Speed system allows the operator to select speeds from 5 mm/minute to over 100 mm/second.

The standard chart drive motors are DC operated with integral gear reduction. It is equipped with an AC output tachometer whose sinusoidal output frequency is 8 times that of the motor armature. The amplitude of the tachometer output varies with the motor RPM, but the motor control responds to frequency changes only.

The motor control integrated circuit measures the output frequency of the motor tachometer, and produces a voltage which is linearly proportional to that frequency. The output of this integrated circuit is compared to the output of a voltage divider comprised of precision resistors. It is then inverted and fed to a transistor which controls the voltage of the DC motor. If a motor finds itself under load, the voltage output from the integrated circuit goes down as the frequency of the tachometer goes down. The difference signal is inverted and appears at the motor as an increased voltage at the armature. This system provides better than 2% regulation of chart speed at normal line voltage combinations.

G. DC TO DC CONVERTER SYSTEM

The function of this modular converter system is to change the 12 VDC battery supply to the voltage required by the galvanometer. It has two outputs: ± 18 VDC regulated which powers the servo amplifier and 12 VDC which powers the styli.

H. POWER SUPPLY

The power supply converts primary AC line power to 12 VDC. This primary power supply serves two purposes. It first recharges the internal 12 VDC batteries and, when required, supplies 12 VDC to the system for continuous operation. When not plugged into line power the recorder will operate in battery mode.

I. EVENT MARKER

The event markers are actuated by an external contact enclosure through a front mounted mini phone jack, or by internal timer, or both. When activated, the stylus deflects down onto the chart paper and writes as long as the marker is energized. When the voltage is removed, the stylus is raised off the paper. By controlling the energizing voltage, a series of dashed lines can be written on the chart to mark key data locations.

J. EVENT MARKER TIMER

A one second/one minute timer provides short one second pulses when the chart drive is operated in the mm/second range; long one minute pulses when the chart drive is operated in the mm/minute range. The timer may be turned off by a front mounted switch.

K. SIGNAL INPUT CONFIGURATION

The DASH II has two single-ended floating inputs: black is common and gray positive with respect to black.

L. BATTERIES

The recorder is powered by 4.5 amp/hour gel-cell type batteries which are connected in parallel. The batteries are charged by the integral charger/power supply.

Battery endurance will vary widely depending upon the chart speed, stylus heat, and signal characteristics. High speed, high heat, and complex signal wave forms require more power, and will result in shorter operating endurance between charges. Typical battery endurance will range 5 to 6 hours. Batteries generally operate longer if they are cycled. Even if battery operation is not necessary, the recorder should be operated on battery power regularly. When not in use, the batteries will charge, providing that the recorder is plugged in.

2. SYSTEM SPECIFICATIONS

GALVANOMETERS	Closed loop position feedback servo system.
NUMBER OF CHANNELS	Two
CHANNEL WIDTH	50 mm
WRITING METHOD	Edge writing on low cost thermal paper with blue or black traces.
FREQUENCY RESPONSE	Flat to within 1 db full scale (50 mm) to 30 Hz.; Flat to within 1 db at 10 mm peak-to-peak at 100 Hz.
LINEARITY	Within 1% of full scale
PRESENTATION	Rectilinear coordinates
SENSITIVITY	1 mv/mm to 1 v/mm in 13 steps.
ATTENUATOR	Fourteen Steps: 1, 2, 5, 10, 20, 50 mv/mm; .1, .2, .5, 1, 2, 5, 10 v/mm plus "Off".
MEASUREMENT RANGE AND MAXIMUM RANGE VOLTAGE	50 - 500 V full scale calibrated. 500 V maximum input DC to peak-to-peak AC.
CALIBRATION	Switch selected internal calibration or continuously variable gain adjustment.
INPUT	1 megohm single ended and floating.
SIGNAL INPUT	Front panel binding posts
STYLUS ZERO CONTROL	Front panel potentiometer allows the base line (zero signal level) to be positioned anywhere on the chart.
STYLUS HEAT ADJUSTMENT	Heat automatically adjusts according to chart speed. Also, front panel mounted manual adjustment provided.
DRIFT	Less than 1 mm in 24 hours.
OPERATING TEMPERATURE RANGE	0° - 40° C (32° - 104° F), 5 - 95% relative humidity, non-condensing.
EVENT MARKER	Two event markers are provided, one in each margin operated by external switch closure, by the internal timer, or both.

TIMER	A one second/one minute timer provides short one second pulses and long one minute pulses when the chart drive is operating in the mm/second range; it provides only one minute pulses when in the mm/minute range. The timer may be turned off via front panel switch.
CHART SPEEDS	The Comp-U-Speed system provides 32 speeds from 5 mm/minute to 100 mm/second. The front panel pushbutton switch as an mm/minute and mm/second select button and five speed select pushbuttons marked 5, 10, 25, 50 and 100 (non-interlocking). The chart speeds are the sum of all buttons pushed down. Thus, the following speeds may be obtained: 5, 10, 15, 25, 30, 35, 40, 50, 55, 60, 65, 75, 80, 85, 90, 100 mm/second and mm/minute.
OPERATING MODES	Operates from line or internal battery. Will operate without batteries installed.
BATTERY CHARGER AND INDICATOR	Charger is built-in; recorder may be operated during charge cycle. Digital indicator indicates when charge cycle is completed or when battery needs recharge.
BATTERY	Rechargeable gel type factory installed. Approximately 5 to 6 hours of operation between charges.
POWER REQUIREMENTS	110/220 VAC; 50, 60 or 400 Hz.
WEIGHT	28 lbs. (12.7 KG) (approximately 20 lbs. without batteries).
SIZE	8½"W x 14"L x 10"H (21.6 cm x 35.5 cm x 25.4 cm)
COLOR	Metallic gray case, black front panel with white lettering.

3. OPERATION

A. COVER AND POWER CORD (Figure 2)

The cover on this unit may be removed to accommodate shelf use. To do so, slide the cover in the direction of the arrows. The polarized power cord is easily removed and installed for adapting to AC line mode or to charge the batteries. The connector is located at the top of the unit.

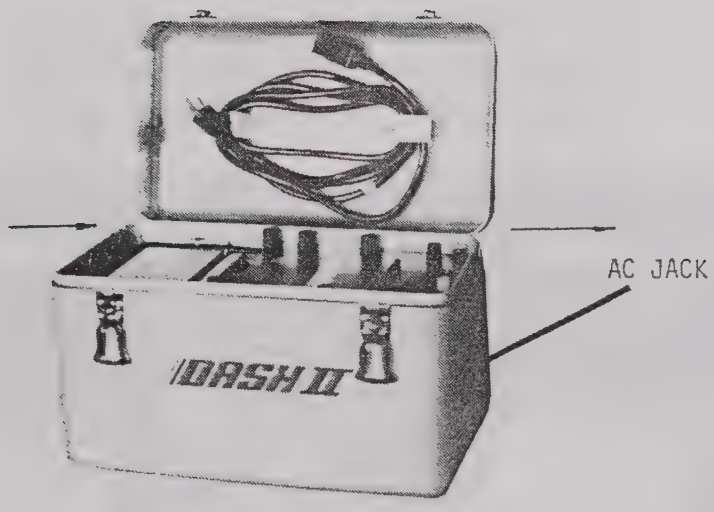


FIG. 2

B. CHART PAPER LOADING (Figure 3, 4, 5, 6)

1. Locate paper carriage release lever. With one hand support the carriage, and lift the release lever with the other. The paper carriage will "pop" open. (Figure 3)

2. Press the spring loaded buttons on each side of the roll mandrel, and remove. (Figure 4)

3. Place the new roll of paper on the mandrel. The paper rolls out from the bottom. Load chart roll. (Figure 5)

4. Pull out about 6 inches of paper from the roll and depress the door into its closed and locked position. The chart paper will automatically thread itself between the drive roller and the pressure roller. (Figure 6)

5. Turn the power on and press the 25 mm/second chart speed button. The paper will align itself in approximately 10 seconds or 10 - 12 inches of chart paper.

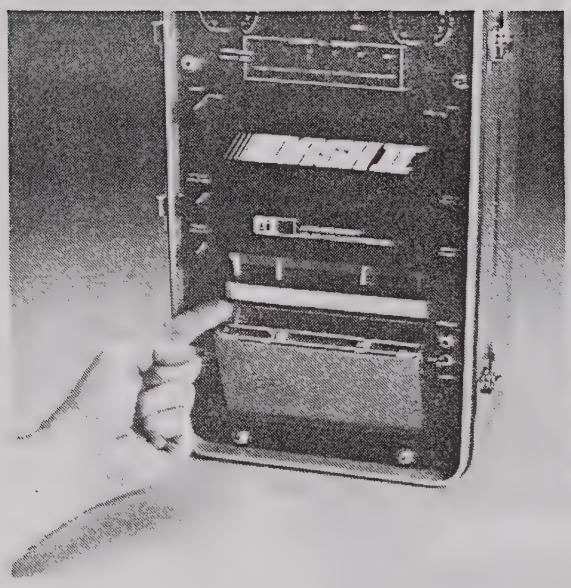


FIG. 3

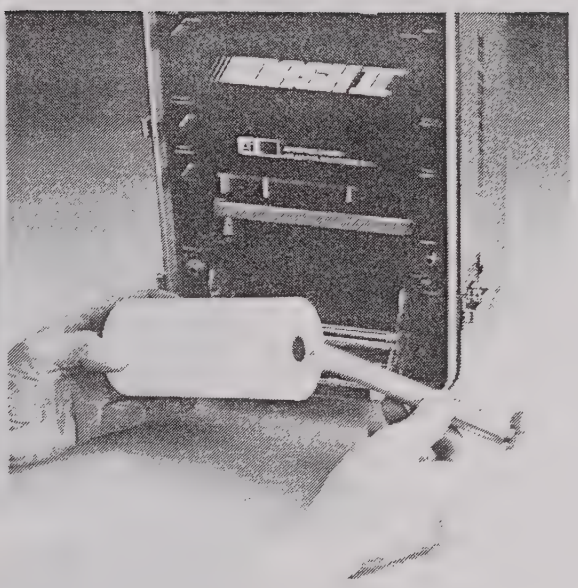


FIG. 4

FIG. 5

FIG. 6

4. FRONT PANEL CONTROLS (Figure 7)

NOTE: (2) indicates controls for 1st channel (left) and 2nd channel (right).

A. POWER SWITCH

This switch controls power to the recorder. However, the battery will continue to be charged, regardless of switch position. The recorder is connected to AC line power.

B. ATTENUATOR (2)

The attenuator acts as an internal signal conditioner. To place attenuator into calibration, operator must switch the variable gain control to the cal position.

C. VARIABLE GAIN/CAL (2)

Continuously variable gain control allows sensitivity adjustment from calibrated to approximately 1/5 the marked sensitivity positions on the attenuator. To calibrate the attenuator put the gain control into the cal position.

D. STYLUS POSITION (2)

There is a position control for setting the stylus "zero" anywhere across the 50 mm channel width.

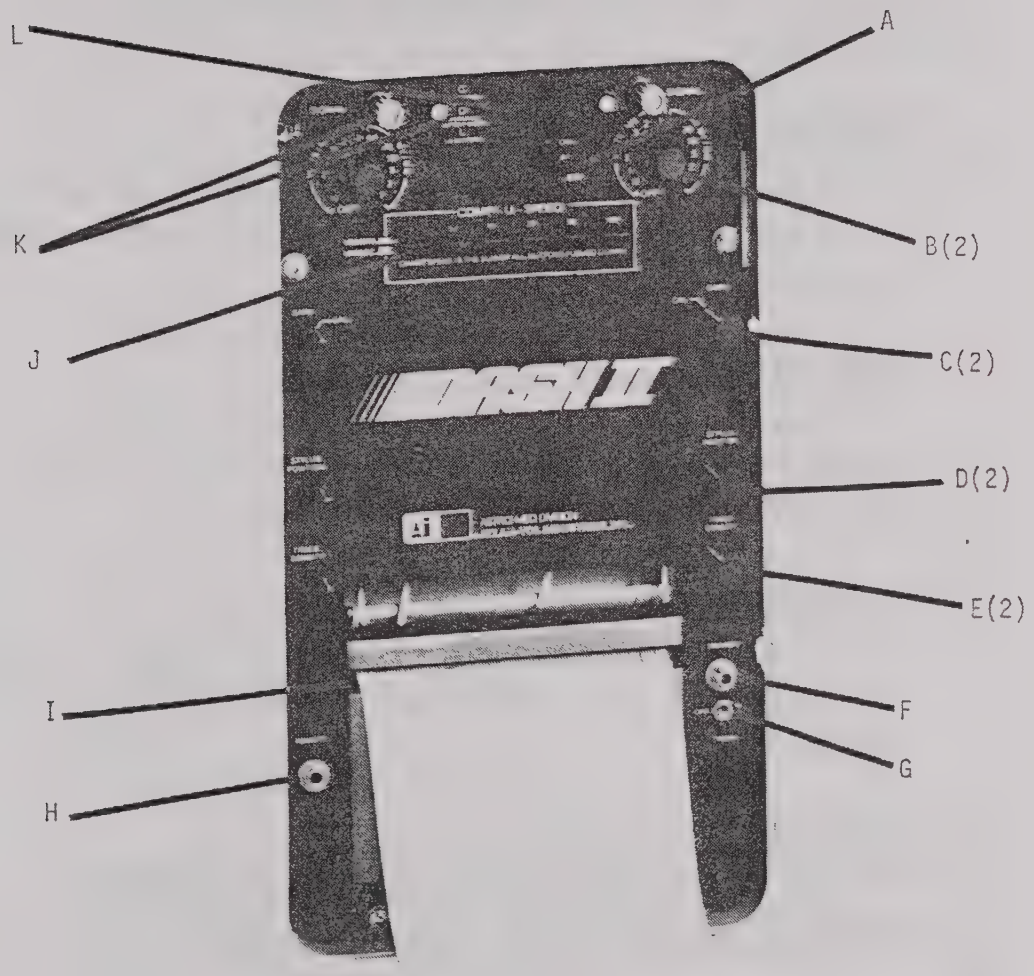


FIG. 7

E. TRACE DENSITY (2)

The trace density of the DASH II is automatic with relation to chart speed. The trace density control permits the adjustment of the initial acceptable trace width as required by the operator and/or the signal level. Once the trace adjustment is made, the stylus heat will be compensated for any chosen speed.

F. EVENT MARKER REMOTE JACK

A mini phone jack is provided for the external operation of the two event markers. (No voltage required, just the switch closure.)

G. TIMER SWITCH

This control activates the internal timer. The duty cycle (seconds or minutes) will be selected automatically according to the chart speed.

H. REMOTE CHART DRIVE

A phone jack is provided for a remote start/stop actuation of a preselected speed. (No voltage required, just the switch closure.)

I. PAPER CARRIAGE RELEASE LEVER

Releases paper carriage and mandrel for chart paper removal and insertion. Lever operates by pushing up.

J. CHART SPEED SELECTOR

The Comp-U-Speed system provides 32 chart speeds from 5 mm/minute to 100 mm/second. The first pushbutton switch is a mm/minute and mm/second select button, and the five non-interlocking pushbuttons mark the actual speed. The chart speed is the sum of all the buttons pushed in. Push in once to engage and again to disengage. The following speeds can be obtained: 5, 10, 15, 25, 30, 35, 40, 50, 55, 60, 65, 75, 80, 85, 90, 100, both in mm/minute and mm/second range.

K. SIGNAL INPUT CONNECTORS (2)

The signal inputs to each channel are two binding posts located at the top of the front panel. A positive signal applied to the gray binding post with respect to the black common post and will cause the stylus to deflect to the left. The input circuit of this recorder is single-ended and floating. This means that the DASH II will record the voltage across any element in a circuit, even if both ends of that element are above common ground or frame.

L. LED BATTERY STATUS INDICATOR

Battery condition and mode of operation are as follows:

C	Battery is charging, normal operation AC line mode.
O	Normal operation DC mode.
L	Battery low, switch to AC line power.

5. MAINTENANCE AND ADJUSTMENTS PROCEDURES

A. STYLUS PRESSURE ADJUSTMENT (Figure 8)

Access to the stylus is from the front panel of the recorder just below the overlay. It is not necessary to remove the recorder from the case to replace or adjust the stylus.

1. Power on.
2. Disengage all chart speed buttons.
3. Lift off magnetic overlay, no attaching screws. (Figure 10)
4. Locate stylus assembly.
5. Adjust stylus pressure by turning clamping screw clockwise to increase pressure and counterclockwise to decrease.
6. Set for 5 to 10 mm/minute chart speed and check pressure.
7. Repeat steps if necessary.

The use of a stylus pressure gauge is recommended, taking the measurement when the stylus is approximately 1 mm above the chart (20-25 gr.). However, this is a very powerful galvanometer and a wide range of pressure is allowable. Approximately the correct pressure will be achieved by turning the clamping screw clockwise ½ to 2/3 turn past the point where the stylus tip just contacts the chart paper.

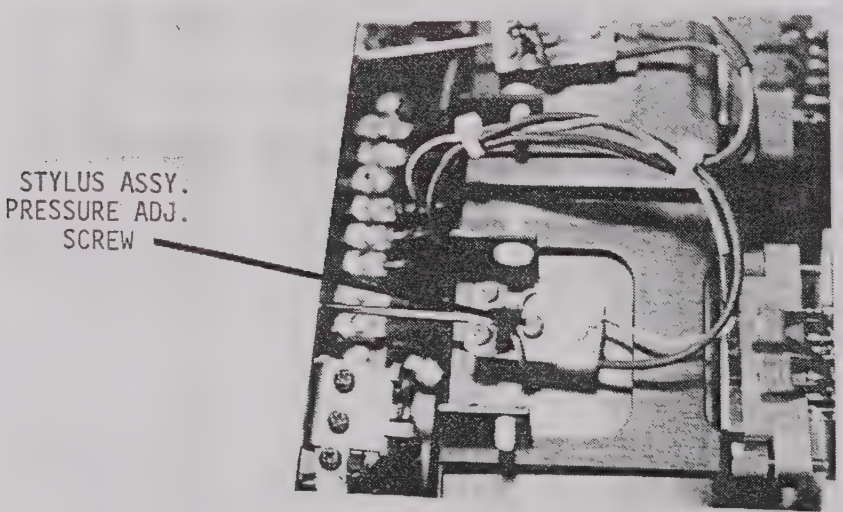


FIG. 8

B. STYLUS REPLACEMENT (Figure 9)

To replace the stylus, leave power on and proceed as follows:

1. Turn conditioner "off".
2. Set stylus position at the center of its 50 mm channel.
3. Remove the magnetic overlay. (Figure 10)
4. Locate the stylus to be replaced.
5. Locate the stylus set screw, loosen with a #20 Allen Key (.050") and remove. (Figure 9)
6. Loosen the spade lug connector screw.
7. Remove stylus.
8. Replace stylus in reverse order.

ZERO POSITIONING

To position stylus at center of channel.

1. Remove stylus mounting screws.
2. Reset stylus on galvo post to center of channel.
3. Replace mounting screws.

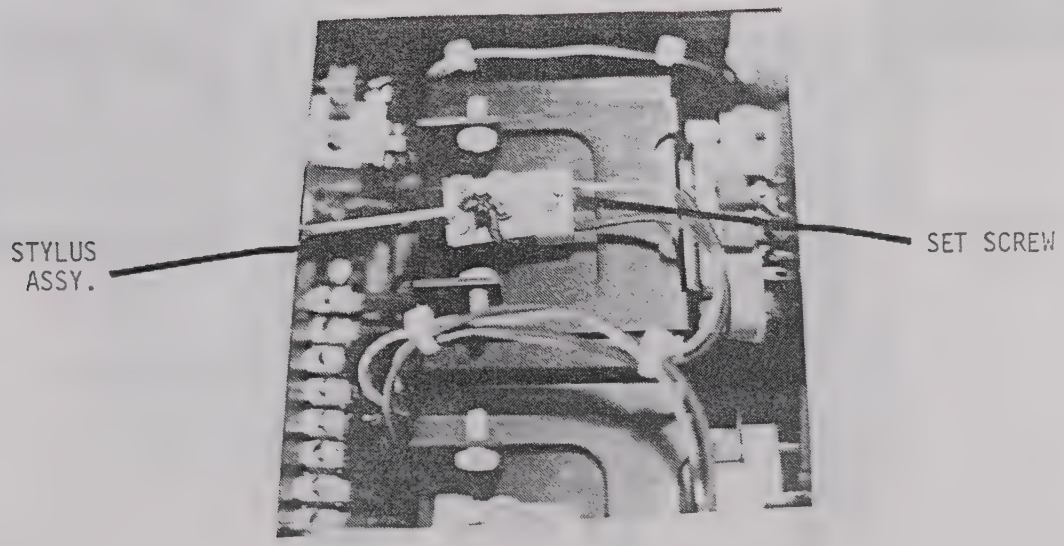


FIG. 9

C. EVENT MARKER STYLUS

It is seldom necessary to replace or adjust the event marker styli. Follow steps (Section A & B) if needed.

D. REMOVING RECORDER FROM CASE (Figure 10, 11, 12)

It is necessary to remove the recorder from the case for access to the batteries and fuses. Any adjustments made inside the recorder should be performed by qualified technicians only.

1. Lift off magnetic overlay. (Figure 10)
2. Remove the screws holding down the front panel. (Figure 11)
3. Carefully stand the recorder upright and slide out from case. The battery leads are long enough to do so without damage to the recorder. (Figure 12).
4. Remove the battery clips at the terminal, if necessary. Replace in the reverse order.

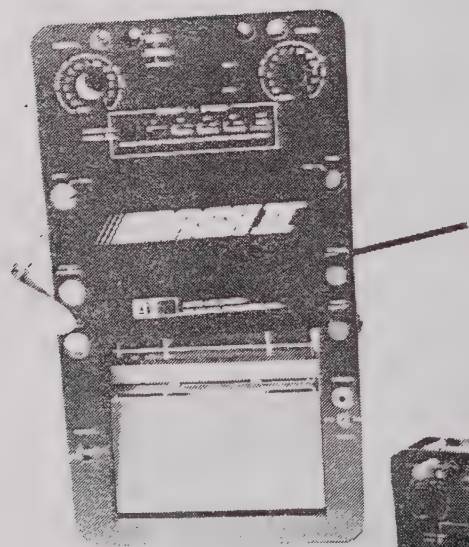


FIG. 10

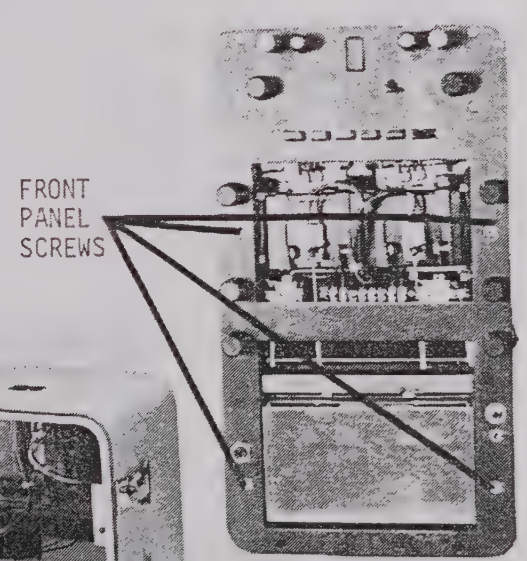


FIG. 11

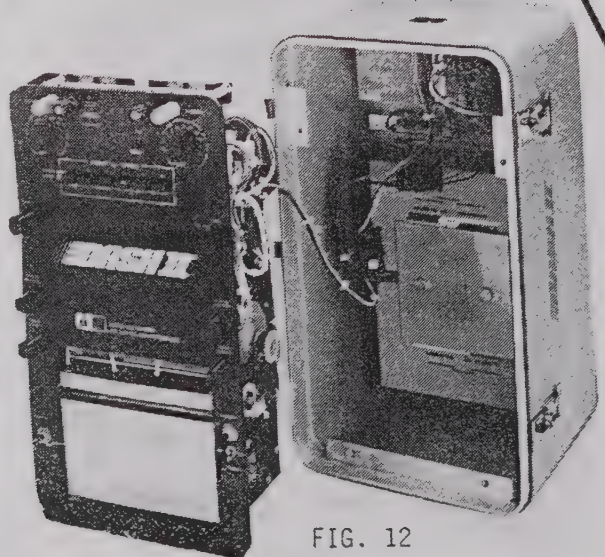


FIG. 12

E. FUSE REPLACEMENT (Figure 13, 14)

There are two fuses in the recorder. Located behind the front panel just above the motor control board is the 3 amp DC power fuse. (Figure 13) Located inside the case adjacent to the batteries is the 1 amp AC power fuse. (Figure 14) Replace these as you would any fuse.

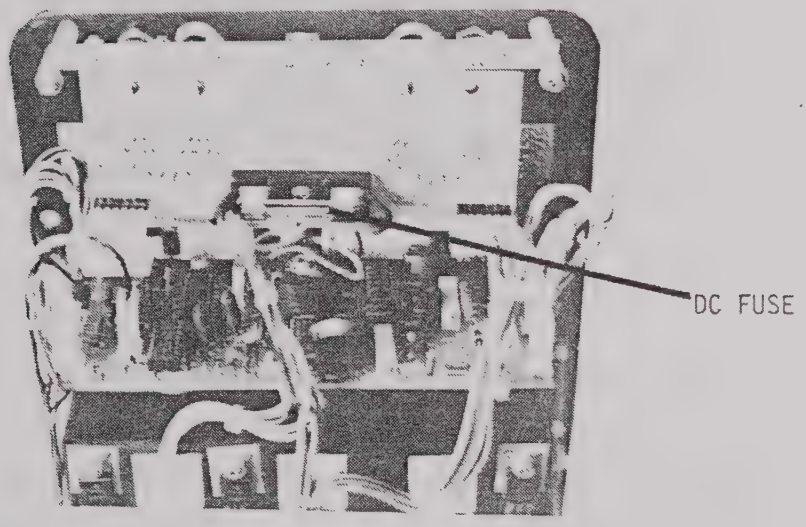


FIG. 13

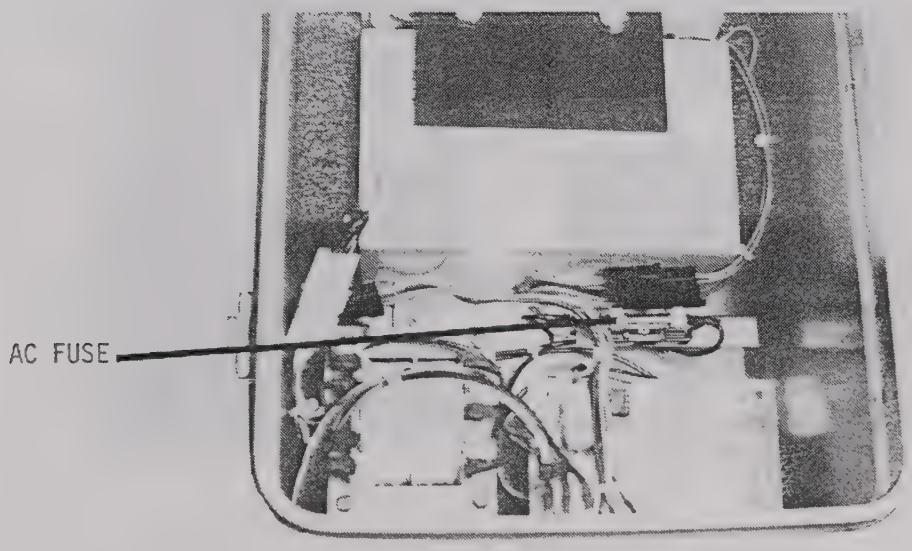


FIG. 14

F. BATTERIES (Figure 15)

The two gel cell batteries are clamped into polystyrene "pockets" in the bottom of the recorder case.

1. Remove the recorder from the case (see Section 5-D).
2. Locate power leads to battery, remove clips.
3. Remove the lead that connects the two batteries in parallel.
4. Remove the metal plate that holds the batteries in place.
5. Lift out the batteries.
6. Replace batteries and install that parallel connection first (positive to positive).
7. Connect the power leads (red positive +, black negative -).

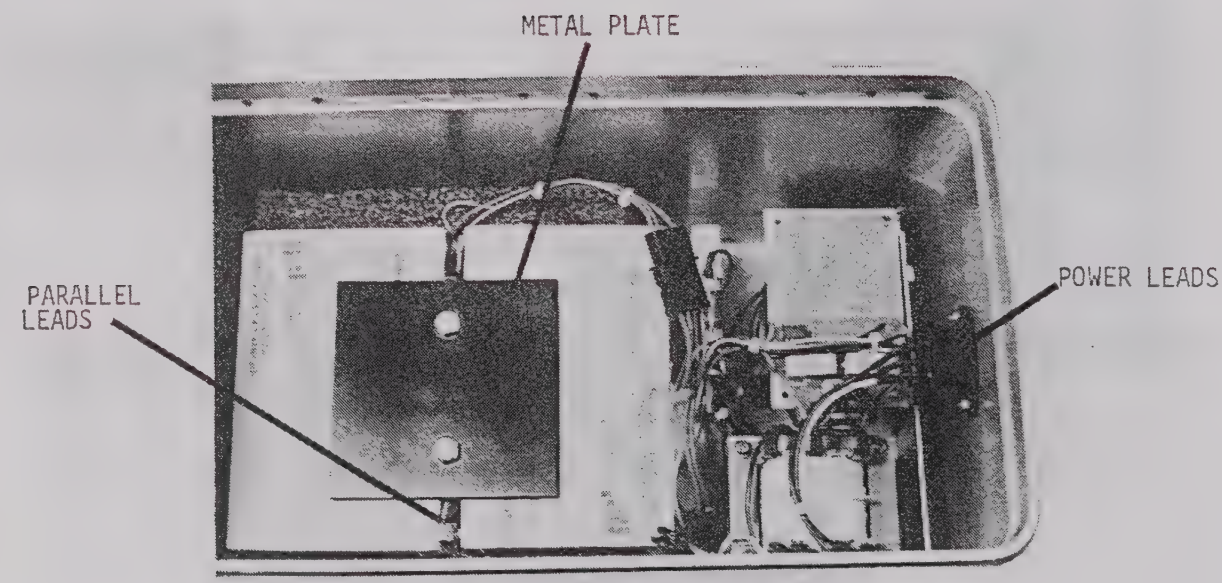


FIG. 15

G. CALIBRATION

To calibrate the recorder to agree with the settings on the attenuator, simply place the gain control to the cal position. The recorder is now calibrated to accept signals whose value may be determined by the attenuator setting.

To calibrate the recorder for settings not marked on the attenuator, proceed as follows:

1. Set stylus position to zero.
   Note that zero may be set anywhere over the 50 mm channel. If only positive going signals are to be recorded, then zero should be set at the extreme right line of the chart, negative extreme left of chart.
2. Set the attenuator to a setting high enough to include your maximum signal.
3. Turn the gain control off.
4. Insert your external signal and turn the gain control to set the stylus at "full scale".

The recorder is now calibrated for external full scale signal.

6. MAJOR COMPONENT REPLACEMENT AND ADJUSTMENT

A. GALVANOMETER DAMPING (Figure 16)

Damping adjustment may be made by means of the recessed trim potentiometer located on the lower right hand corner when looking at the top of the galvo. The potentiometer is set at the factory for maximum flat response, and should only require adjustment when necessary to replace the galvo.

1. Remove the recorder from the case. (See Section 5-D)
2. Locate the galvo and damping adjustment screw.
3. Insert a 1 cm amplitude square wave.
4. Adjust the damping screw for ¼ mm of overshoot.
5. Replace the recorder in the case.
6. Set low chart speed and check.

Inspect and test, repeat all steps if necessary.

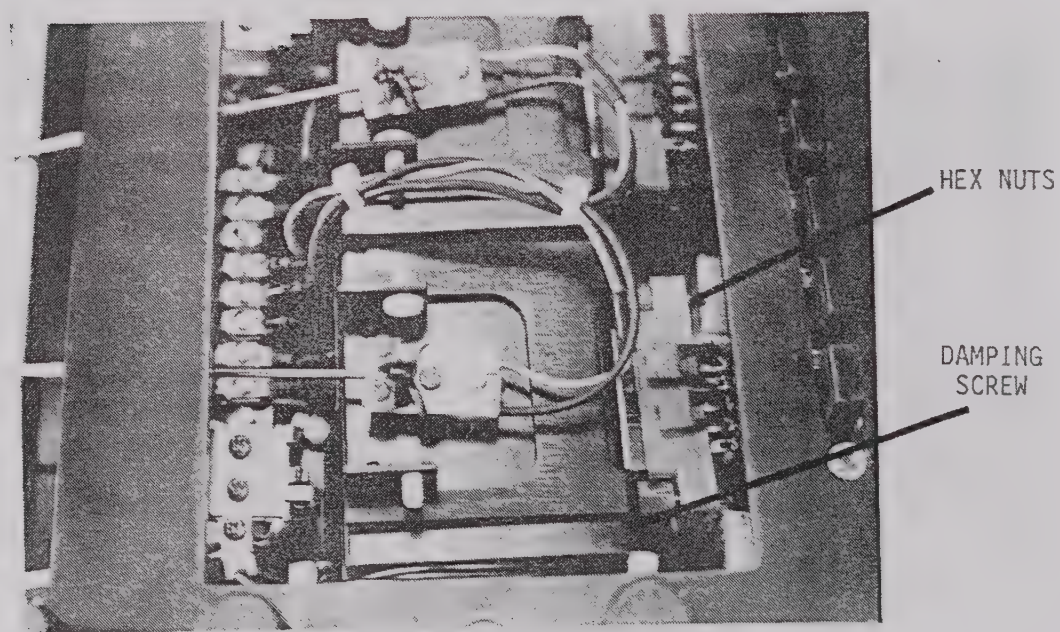


FIG. 16

B. GALVANOMETER REPLACEMENT (Figure 17)

Galvos may be removed and replaced individually.

1. Remove recorder from case (see Section 5-D).
2. Remove stylus (see Section 5-B).
3. Remove the two 4-40 Hex nuts from the connector beside the galvo.
4. Slide the PC limiter board assembly back and away from the galvo and free of the mounting studs.
5. Locate the four 6-32 mounting screws on the side panel.
6. Support the galvo and remove the four screws.
7. Pull the galvo up and out of the recorder.
8. Reverse steps to replace.
9. Adjust damping (see Section 6-A).
10. Replace stylus (see Section 5-B).
11. Set low chart speed and test.

Inspect, repeat all steps if necessary.

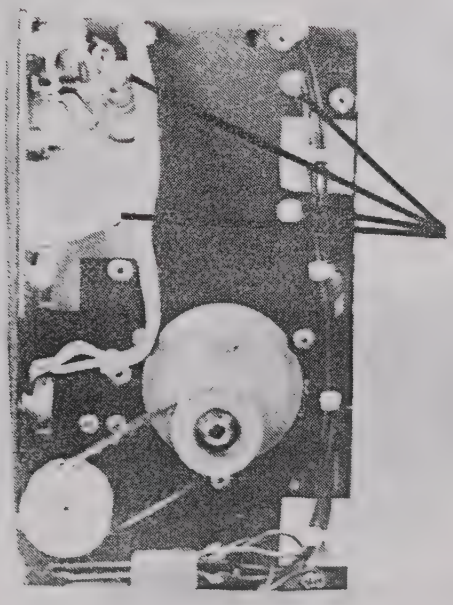


FIG. 17

C. PREAMP OFFSET (Figure 18)

Preamplifier offset trim potentiometer is located on the first PC board attached to the rear of the attenuator switch.

1. Remove recorder from case (see Section 5-D).
2. Power on.
3. Attenuator off.
4. Place a meter across the two end terminals in the gain pot for that channel. (Meter set 1 V or less DC.)
5. Adjust the trim pot on the preamp board until the meter reads zero volts.

D. GAIN CALIBRATION (Figure 18)

Located on the same board as listed above is the trim potentiometer for adjusting the calibration of the step attenuator.

1. Remove recorder from case (see Section 5-D).
2. Power on.
3. Set the stylus so that zero positions at the far right of the channel.
4. Connect a precise 50 mv level to the input.
5. Switch the attenuator to the 1 mv/mm position.
6. Trim pot so that there is perfect full scale deflection for the 50 mv.

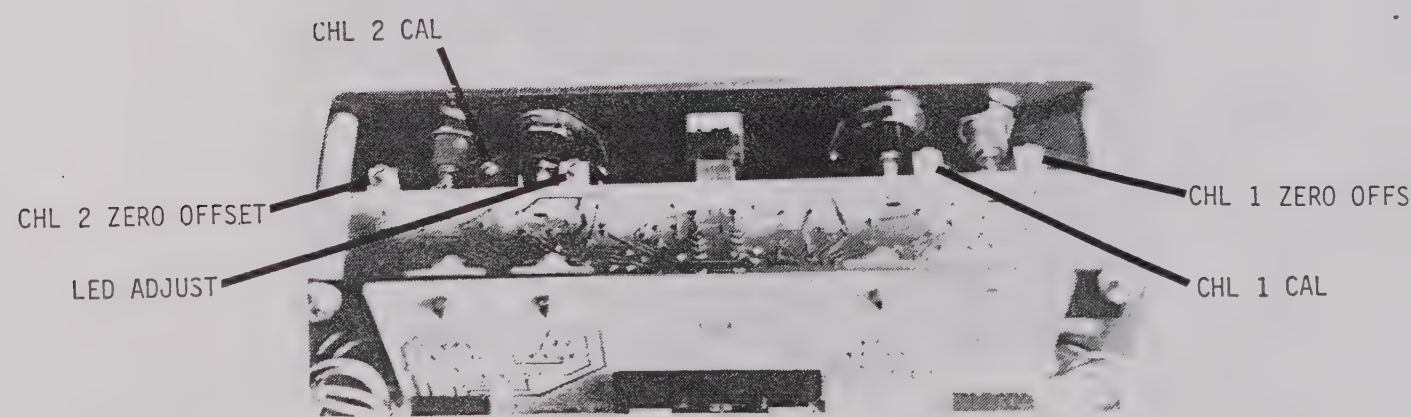


FIG. 18

E. AUTOMATIC HEAT CONTROL ADJUST (Figure 19)

The automatic heat control potentiometer is located on the motor control board. A scope should be used for this adjustment.

1. Remove the recorder from the case (see Section 5-D).
2. Connect the scope across the stylus leads.
3. Set the scope to read a 12 VDC level.
4. Turn the recorder on.
5. Set the chart speed at 100 mm/second.
6. Set the trace control to maximum heat.
7. Adjust the pot until the scope reads 12 VDC without pulsing.
8. Set low chart speed and check.

Inspect, repeat all steps if necessary.

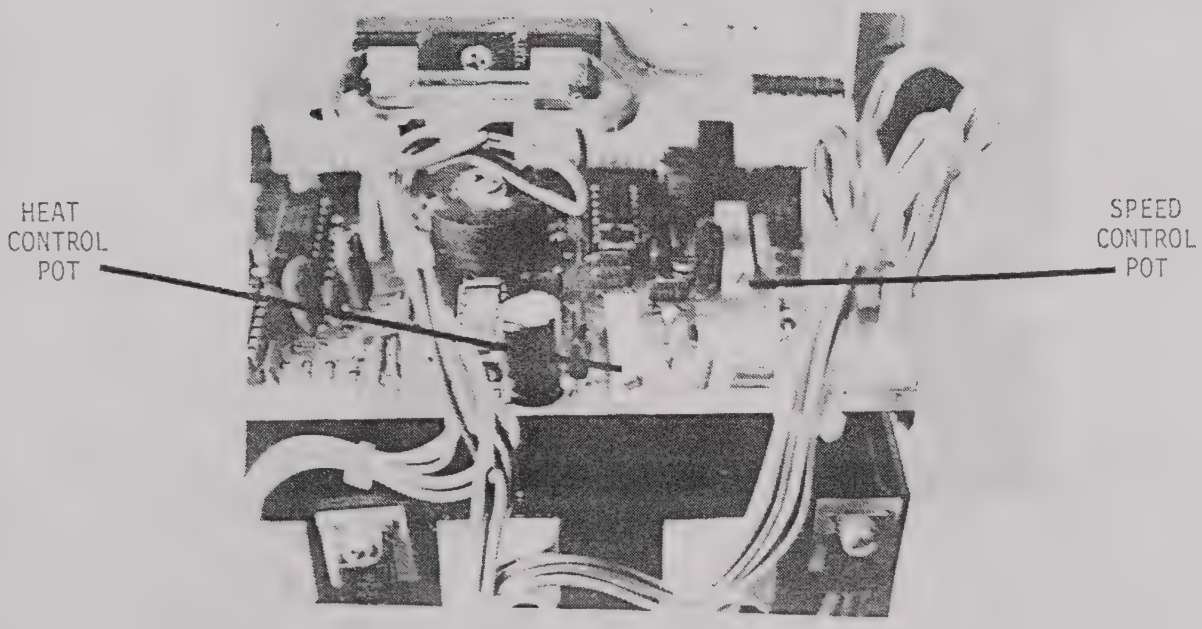


FIG. 19

F. DRIVE MOTORS (Figure 20, 21)

To replace either drive motor, proceed as follows:

1. Remove recorder from case (see Section 5-D).
2. Slide the motor out of its clamp.
3. Loosen the #4 Allen Set Screw in the brass motor shaft adapter and slip the adapter/pulley off the motor shaft.
4. Slip off the drive belt.
5. Disconnect the red and black power leads as well as the yellow tachometer leads from the motor at the respective terminal.
6. Rotate the motor to set the proper tension of the belt. Proper tension is when the belt can easily be deflected 1/8" at a point halfway between the two pulleys.

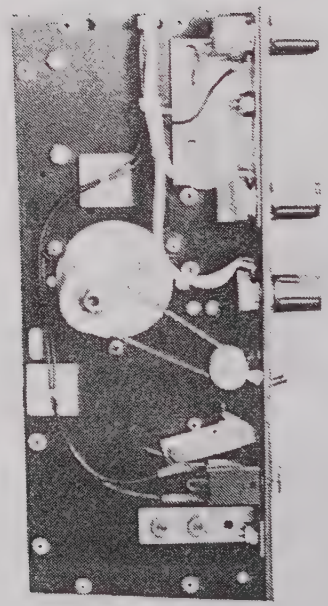


FIG. 20

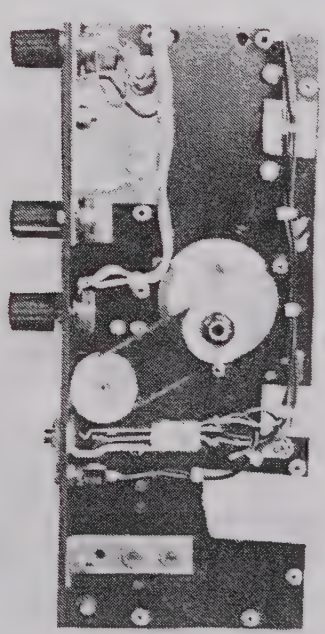


FIG. 21

G. POWER SUPPLY (Figure 22, 23)

To replace the power supply:

1. Remove the four Phillips Head Screws under the case that attaches the power supply to the case.
2. Disengage all connectors, making note to identify each.
3. Install new power supply.
4. Replace all connectors in their proper places.
5. Replace screws to bottom of case.

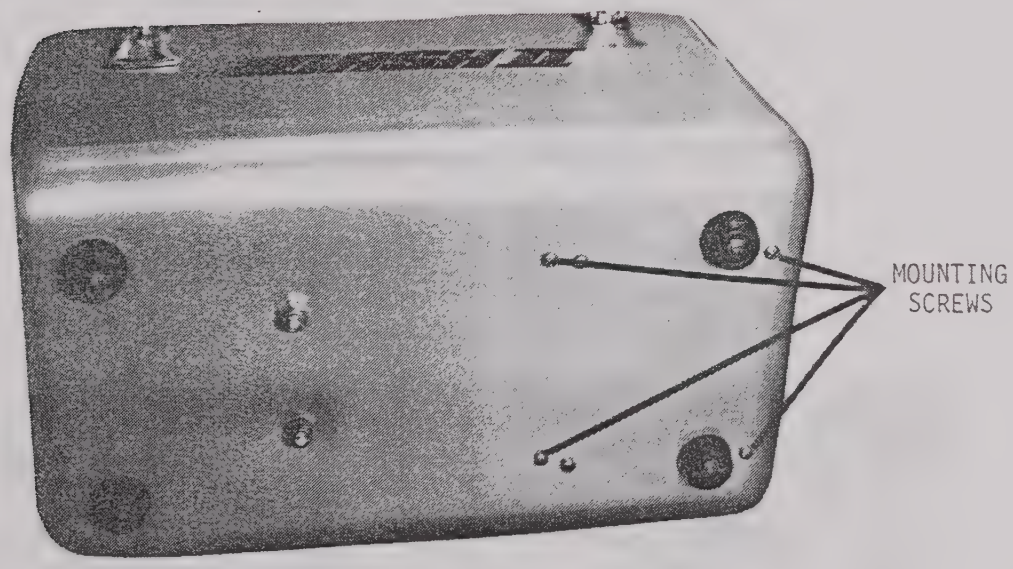


FIG. 22

H. CHART SPEED ADJUSTMENT (Figure 24, 25)

Located on the motor control board are five trim potentiometers. They are set at the factory to correspond to the five fixed speeds on the recorder control panel. If it is necessary to reset or change the fixed speeds refer to illustrations for the proper identification of the proper potentiometer for the respective speed.

Any adjustment or change will be reflected in both the mm/minute and mm/second range.

Trim pot identified in Figure 19 is to coordinate the mm/minute and mm/second speeds. Calibrate the 100 mm/second speed. Then depress the mm/minute button and adjust the trim pot to 100 mm/minute.

Because trim pot adjustment is extremely sensitive, a generous block of time should be set aside for the process.

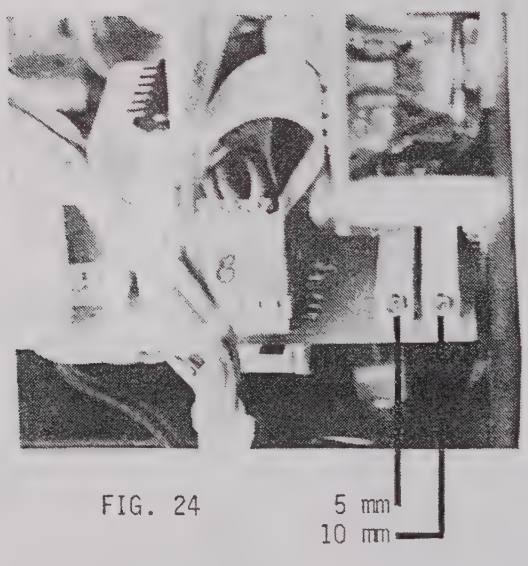


FIG. 24

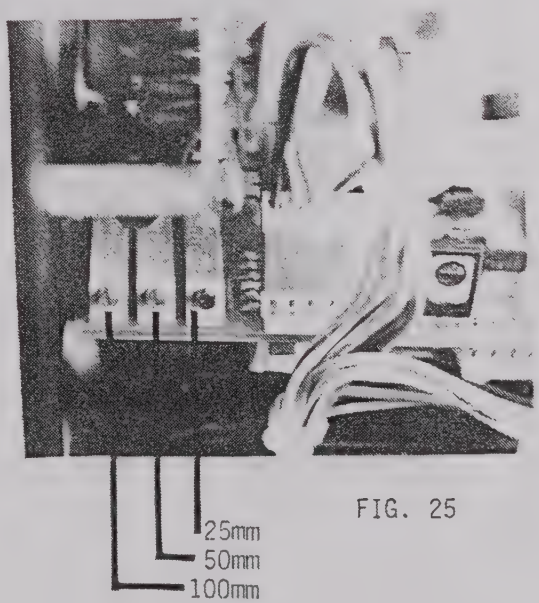


FIG. 25

I. REGULATOR BOARD (Figure 26)

This board is the power supply output section regulator. To replace:

1. Remove the two top mounting screws. (Spacers are very loose.)
2. Carefully disengage connector and ribbon cable, noting their proper placement.
3. Replace in reverse order.

J. PREAMPLIFIER BOARD (Figure 26)

The preamplifier board mounts directly to the chassis behind the regulator board. To replace:

1. Remove the caps from the front of the attenuator knobs and remove the knobs.
2. Remove the two mounting screws in the rear that mount the board to the front panel.
3. Carefully unmount the board, using caution because of cable, connectors and spacers.
4. Disengage all connectors and disconnect wires to input jacks.
5. Replace in reverse order.

K. MOTOR CONTROL BOARD (Figure 26)

The motor control board is located below the regulator and amplifier boards.

1. Remove the regulator board.
2. Remove the preamplifier board.
3. Remove the two screws located on the front panel at each side of the speed selector switches.

NOTE: MARK ALL CONNECTORS AND CABLES BEFORE REMOVING THESE BOARDS.

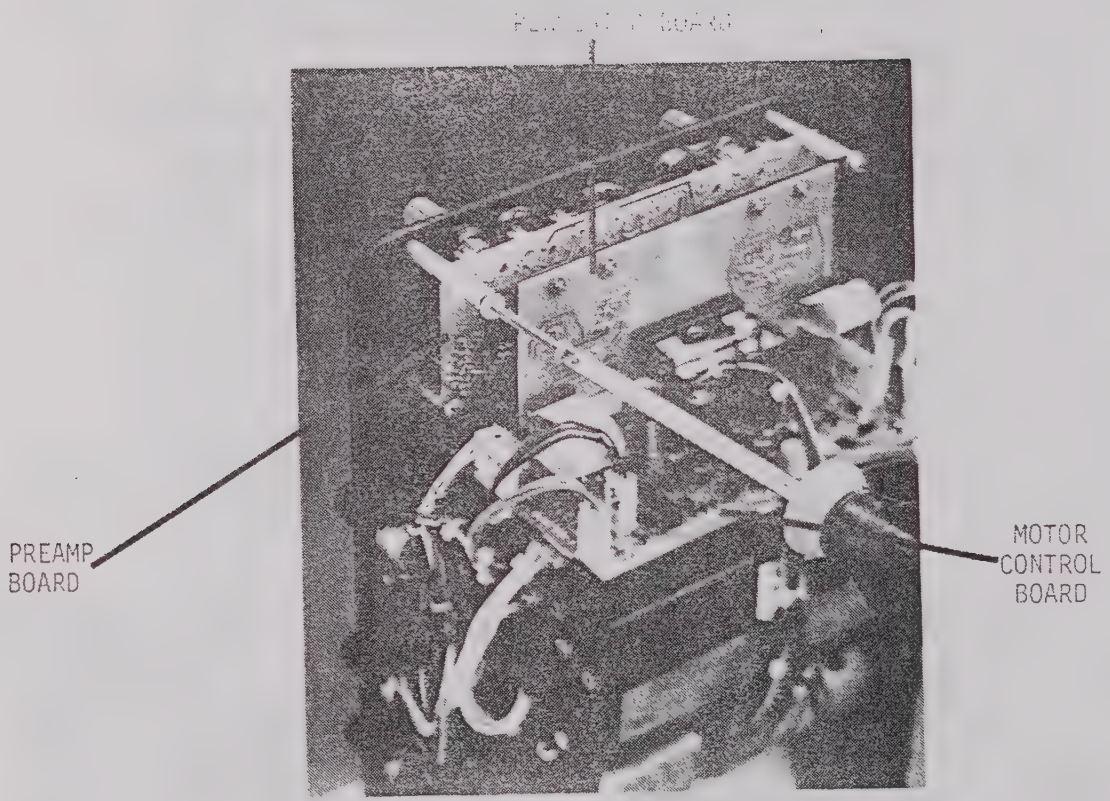


FIG. 26

REPLACEMENT AND SPARE PARTS LIST
DASH II MOD 3

DESCRIPTION	PART NUMBER
Adaptor, Clutch	10077-000
Battery, 12V, 4.5 Amp/Hour	10285-000
Bar, Paper Tearing	20082-000
Belt, Left Hand Side, 79 Teeth	20391-079
Belt, Right Hand Side, 60XL025	10562-060
Case, With Cover	40179-002
Cap, Release Lever	10306-003
Charger Assembly, Power Supply	30568-000
Charger, Power Supply, PC Board	30616-001
Chart Carriage Assembly	40001-012
Chart Paper, 2 Channel	10086-000
Drive Roller, Rubber, Chart	20235-003
Event Marker, Relay Coil	20388-002
Front Panel	40407-001
Fuse, AC, 1.5 Amp	10364-002
Fuse, DC, 3 Amp	10364-008
Galvo, Left Hand Side, Model AFG-12	30255-002
Galvo, Right Hand Side, Model AFG-1	30255-001
Integrated Circuit, Chip 74C14	10991-074
Integrated Circuit, Chip 1458P1	20438-001
Integrated Circuit, Chip 3140E	10991-030
Integrated Circuit, Chip 4001BE	10991-401
Integrated Circuit, Chip 7818CT	20303-002
Integrated Circuit, Chip 7918	20304-002
Integrated Circuit, Chip 2917N	10991-074
Integrated Circuit, Chip 4013BE	10991-413
Integrated Circuit, Chip 72131PD	10991-073
Jack, Remote, Event Marker	10927-003
Jack, Remote, Speed	10568-003
LED Display (C,O,L)	20483-003

DESCRIPTION	PART NUMBER
Mandrel, Chart Roll	20407-005
Motor Assembly, Left Hand Side	21120-005
Motor Assembly, Right Hand Side	21120-000
Motor Control Assembly, PC Board	30616-001
Overlay, Magnetic	40408-000
Plug, Remote, Event Marker	10927-004
Plug, Remote, Speed	10568-004
Post, Binding, Black	10721-002
Post, Binding, Gray	10721-003
Pulley, Clutch Motor Left Hand Side, 30 Teeth	20525-030
Pulley, Clutch Motor Right Hand Side, 11 Teeth	20240-002
Pulley, Drive Roller Left Hand Side, 15 Teeth	20392-015
Pulley, Drive Roller Right Hand Side, 12 Teeth	20236-004
Preamp PC Board Assembly	30603-000
Regulator PC Board Assembly	30614-001
Stylus, Analog, SA-10-DCH	30159-001
Stylus, Event Marker, Left, SE-10-DCH	30222-003
Stylus, Event Marker, Right, SE-10-DCH	30222-004
Stylus, Terminal Block	10535-008
Styrofoam Block	20479-000
Toggle Switch, Power	20829-004
Toggle,Switch, Timer	20311-002
Writing Table	40001-002

F. TROUBLESHOOTING GUIDE

This recorder is covered by a one year warranty on all parts and service. Any repairs performed during the first year must be done at the factory in order to honor the warranty. The troubleshooting guide is provided to assist operating personnel to correct minor problems during normal operation.

PLEASE REFER ANY QUESTIONS REGARDING WARRANTY OR REPAIRS TO OUR CUSTOMER SERVICE DEPARTMENT (401) 828-4000.

PROBLEM	SOLUTION
RECORDER NOT OPERATING	Charge the batteries. Connect the main power supply. Turn the power "on". Replace blown DC fuse. Check the connectors to the battery. Check connectors to boards. Install signal input.
STYLUS NOT OPERATING	Set attenuator controls. Adjust stylus pressure. Set heat controls. Check signal input. Replace damaged stylus.
STYLUS DOES NOT RETURN TO ZERO	Adjust the stylus position control. Check the signal input. NOTE: If after both of these steps stylus does not return to zero, immediately turn recorder off to avoid damage to the galvanometer.

PAPER DRIVE NOT OPERATING	Set the pushbutton controls. Check the connectors to boards. Check remote jack.
PAPER SPEED NOT CORRECTED	Charge the batteries. Adjust the trim potentiometers (Mother Board II).
EVENT MARKER NOT OPERATING	Check remote jack and plug. Turn timer switch "on". Replace event marker stylus. Replace integrated circuit on mother control board.

READER RESPONSE CARD

Astro-Med, Inc.

Astro-Med Industrial Park, 600 East Greenwich Avenue
West Warwick, RI • 401-828-4000 • • FAX 401-822-2430

The recorder you have purchased will provide years of dependable service. This manual is provided to help you understand and operate this recorder.

In order to better serve you, we would appreciate any suggestions you may have regarding the manual or the recorder.

Our Customer Service Department will gladly assist you with any questions you may have.

COMMENTS

You may use this form to communicate your comments about the manual, its organization or subject matter with the understanding that Atlan-Tol may use the information without incurring any obligation to you.

If you would like a reply, print your name and address:

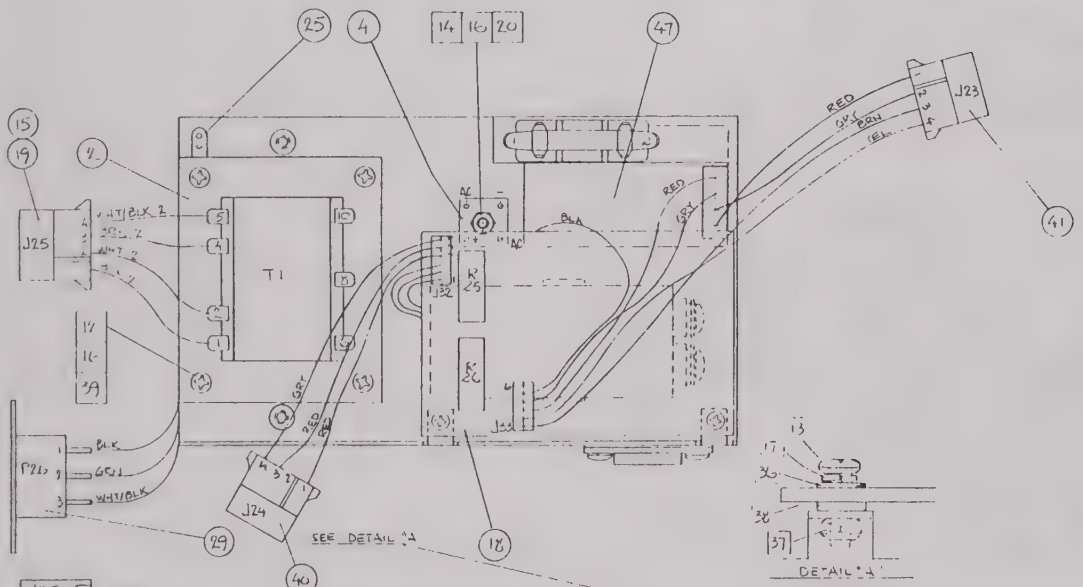
NAME:_____ TITLE:_____

ADDRESS:_____

CITY:_____ STATE:_____ ZIP:_____

PHONE:_____

REVISIONS				
ZONE	CHG LTR	DESCRIPTION	CHG BY & DATE	APP BY & DATE
	B	REDRAW 5317	MSTG 4-19-82	
	C	UPDATE USING 30300002 BOARD 7341 ADD ITEMS 47, 48, 49 & 50	MSTG 11-10-82	



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/64 DECIMALS ±.005 ANGLES ±0°30' ALL SURFACES 63 REMOVE BURRS AND SHARP EDGES MATL –	SIGNATURES	DATE	ASTRO MED DIVISION ASTRO-VOX LABORATORIES INC.
			DWN MSTG	4 1982	ASSY POWER SUPPLY & CHARGER
			CHK		
			ENG		
			MFG		
	DASH II MOD 3		APP		
40A13	40A14		ISSUED		SIZE C CODE IDENT NO 30568000 REV C
NEXT ASSY	USED ON	FINISH	SIMILAR TO		SCALE 1:1 SHEET 2 CONT ON SHEET F
APPLICATION					
DRAWING LEVEL					

FORM 1009

30568000 DRAWING NO. C REV.

REVISIONS				
ZONE	CHG LTR	DESCRIPTION	CHG BY & DATE	APP BY & DATE
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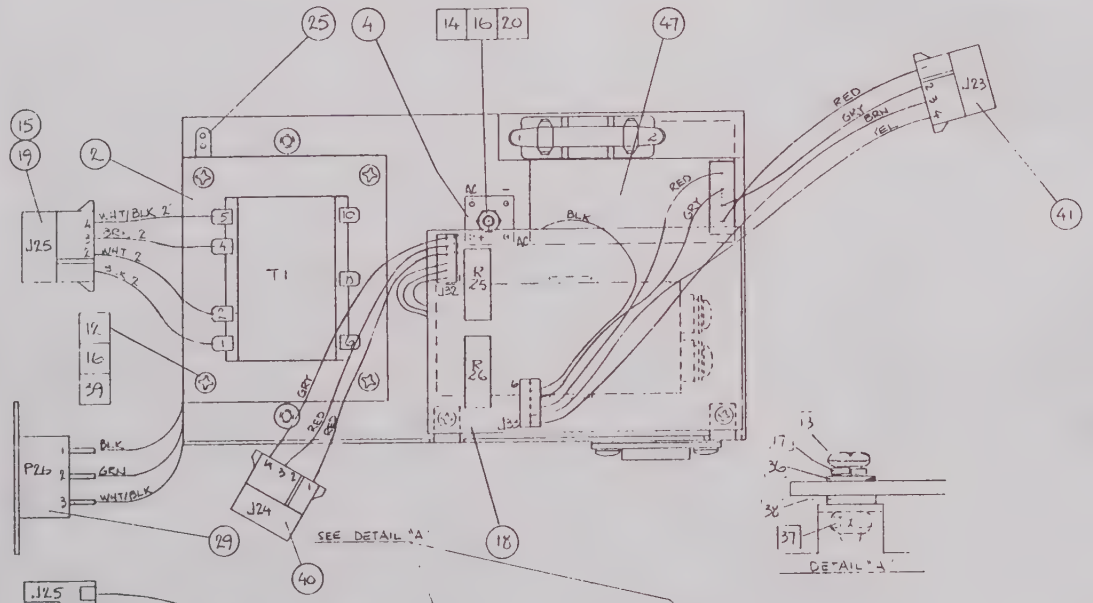
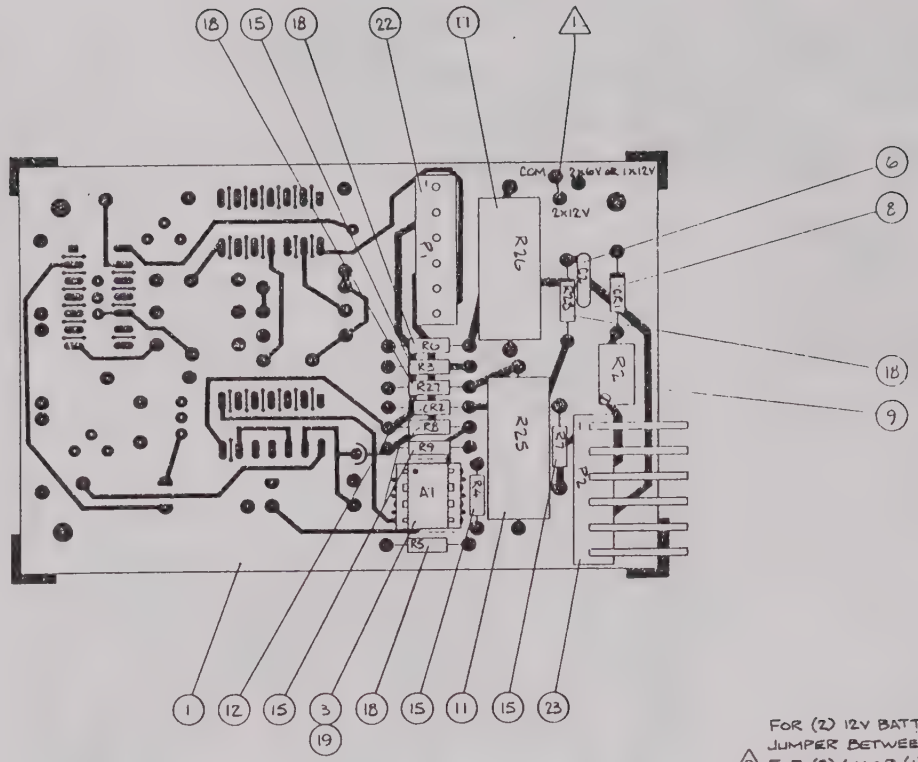
	C	UPDATE USING 30X00002 BOARD 7341 ADD ITEMS 47, 48, 49 & 50	MSTG 11-16-84	



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/64 DECIMALS ±.005 ANGLES ±0°30' ALL SURFACES REMOVE BURRS AND SHARP EDGES	SIGNATURES	DATE	ASTRO-MED DIVISION ASSY POWER SUPPLY & CHARGER
			OWN MSTG	4-19-84	
			CHK		
	DASH II M203		ENG		
40413	40414	MAT'L -	MFG		
NEXT ASSY	USED ON		APP		SIZE C / CODE IDENT NO 1 / 30568000 / REV C
APPLICATION			ISSUED		SCALE 1=1 / SHEET 2 CONT ON SHEET F
DRAWING LEVEL		FINISH	SIMILAR TO		

FORM 1009

REVISIONS					
LTR	DESCRIPTION		CHK	APVD	DATE
H	REDRAW	7341	MSTG 12 2 82		



FOR (2) 12V BATTERIES PLACE JUMPER BETWEEN COM AND 2x12V.

2 FOR (2) 6V OR (1) 12V BATTERY PLACE JUMPER BETWEEN COM AND 2x6V OR 1x12V.

USE INDELIBLE INK TO COPY THE REV LETTER AND DASH No. FROM THIS DWG TO PC BOARD.

NOTE:

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/64 DECIMALS ±.005 ANGLES ±0°30' ALL SURFACES REMOVE BURRS AND SHARP EDGES	SIGNATURES	DATE	ASTRO MED DIVISION ASTRO-TECH INSTRUMENTS, INC.
			DWN MSTG	12-2-82	ASSY CHARGER DASH 2 MOD 3
			CHK		
	4041400X		ENG		
30568000	DASH II	MAT'L-	MFG		
NEXT ASSY	USED ON		APP		
APPLICATION		FINISH	ISSUED		SIZE B CODE IDENT NO 1 — 30800002 — REV H
DRAWING LEVEL			SIMILAR TO		SCALE 2:1 — SHEET 1 CONT ON SHEET 2

REVISIONS				
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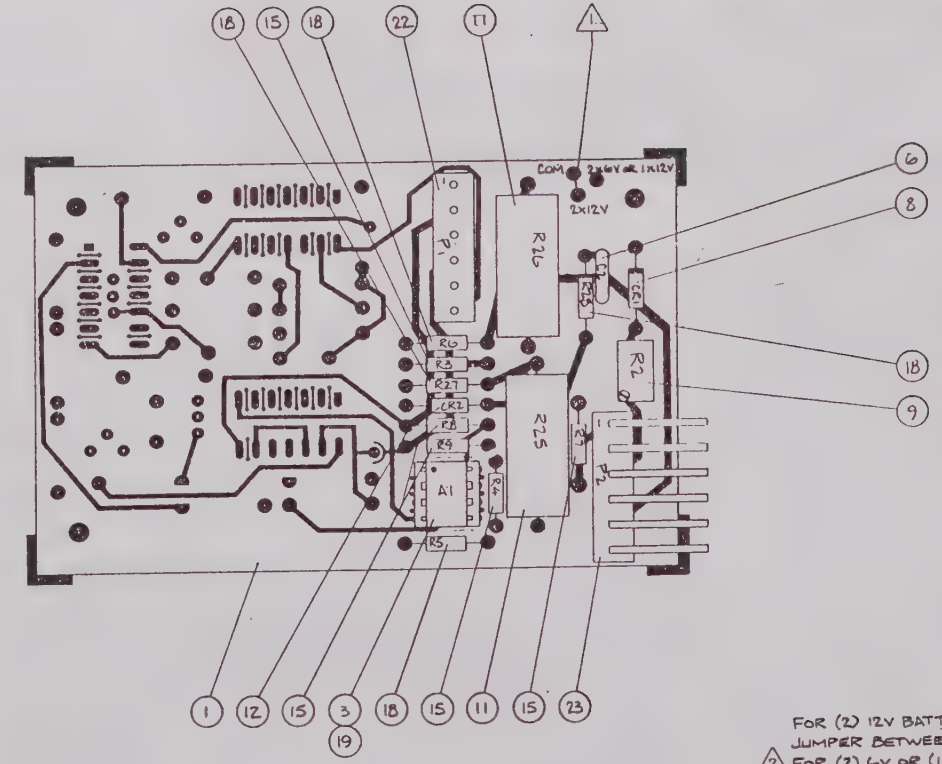
H	REDRAW 7341	MSTG 12-2-82		



2. FOR (2) 12V BATTERIES PLACE JUMPER BETWEEN COM AND 2x12V. FOR (2) 6V OR (1) 12V BATTERY PLACE JUMPER BETWEEN COM AND 2x6V OR 1x12V.

1. USE INDELIBLE INK TO COPY THE REV LETTER AND DASH No. FROM THIS DWG TO PC BOARD.

NOTE:

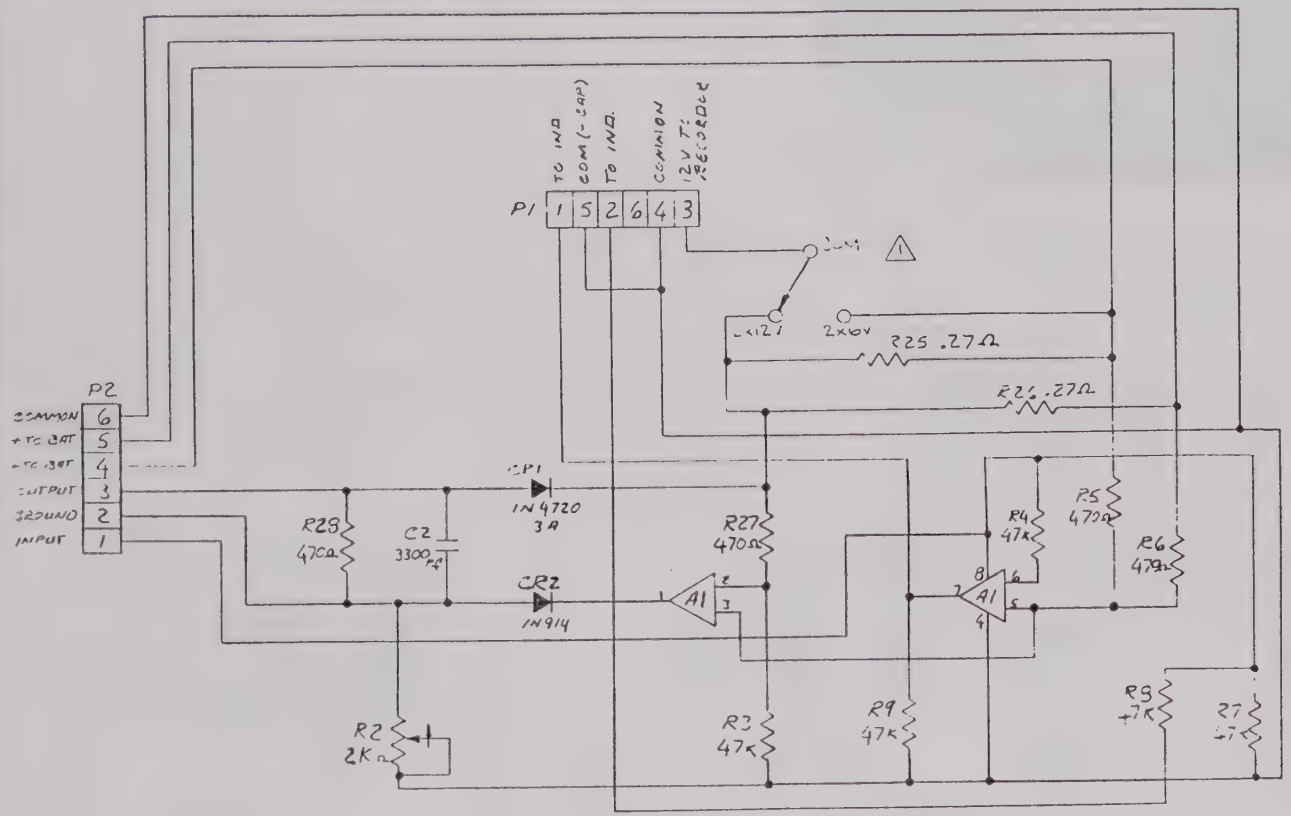
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/64 DECIMALS .XXX ANGLES ±0°30' ALL SURFACES REMOVE BURRS AND SHARP EDGES	SIGNATURES	DATE
			DWN MSTG	12-2-82
			CHK	
			ENG	
			MFG	
	4041400X		APP	
30568000	DASH II	MAT'L	ISSUED	
NEXT ASSY	USED ON			
APPLICATION		FINISH	SIMILAR TO	
DRAWING LEVEL				

ASTRO MED DIVISION
ASTRO-TECH INDUSTRIES, INC.

ASSY
CHARGER
DASH 2 MOD 3

SIZE	CODE IDENT NO		REV
B	1	30800002	H

SCALE 2:1 SHEET 1 CONT ON SHEET 2



FOR (2) 12V BATTERIES PLACE JUMPER BETWEEN COM AND 2x12V.

1 FOR (2) 6V OR (1) 12V BATTERY PLACE JUMPER BETWEEN COM AND 2x6V OR 1x12V

NOTE:

	DASH II
	M33 3
NEXT ASSY	USED ON
APPLICATION	
DRAWING LEVEL	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ±1/64 DECIMALS ±.005 ANGLES ±0°30'
ALL SURFACES 63
REMOVE BURRS AND SHARP EDGES
MAT'L -
FINISH

SIGNATURES	DATE
DWN	
CHK	
ENG	
MFG	
APP	
ISSUED	

SIMILAR TO

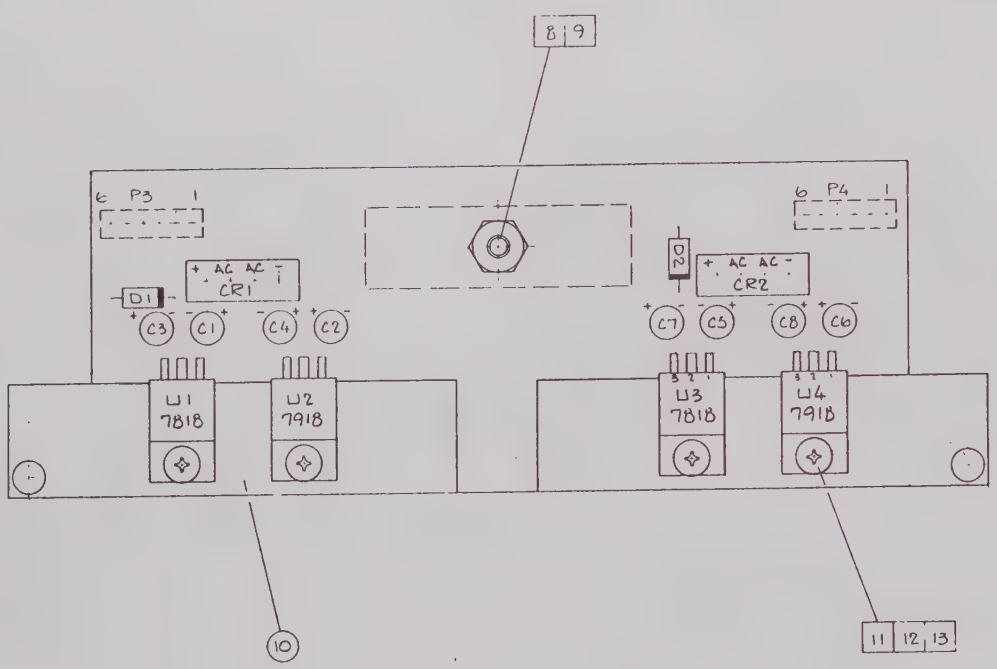
ASTRO MED DIVISION

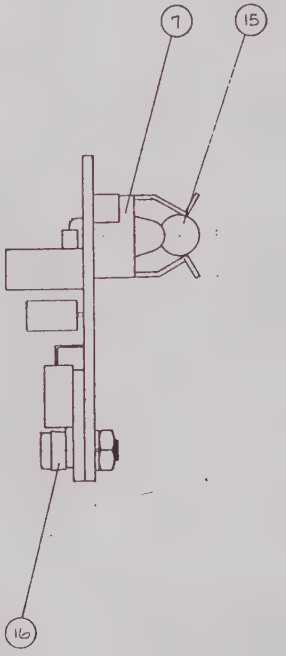
SCHEMATIC

CHARGER / INDICATOR BC

SIZE	CODE IDENT. NO		REV
C		30300032	H
SCALE 4		SHEET 1 CONT ON SHEET F	

REVISIONS				
ZONE	CHG LTR	DESCRIPTION	CHG BY & DATE	APP BY & DATE
	A	-		
	B	REMOVE CIRCUIT BOARD SUPPORT AND HEATSINKS, ADD NEW HEATSINKS. MOUNT P3 & P4 ON OPPOSITE SIDE. 5794	MSTG 10-28-81	
	C	ADD ITEM 16 6548	MSTG 6-30-82	



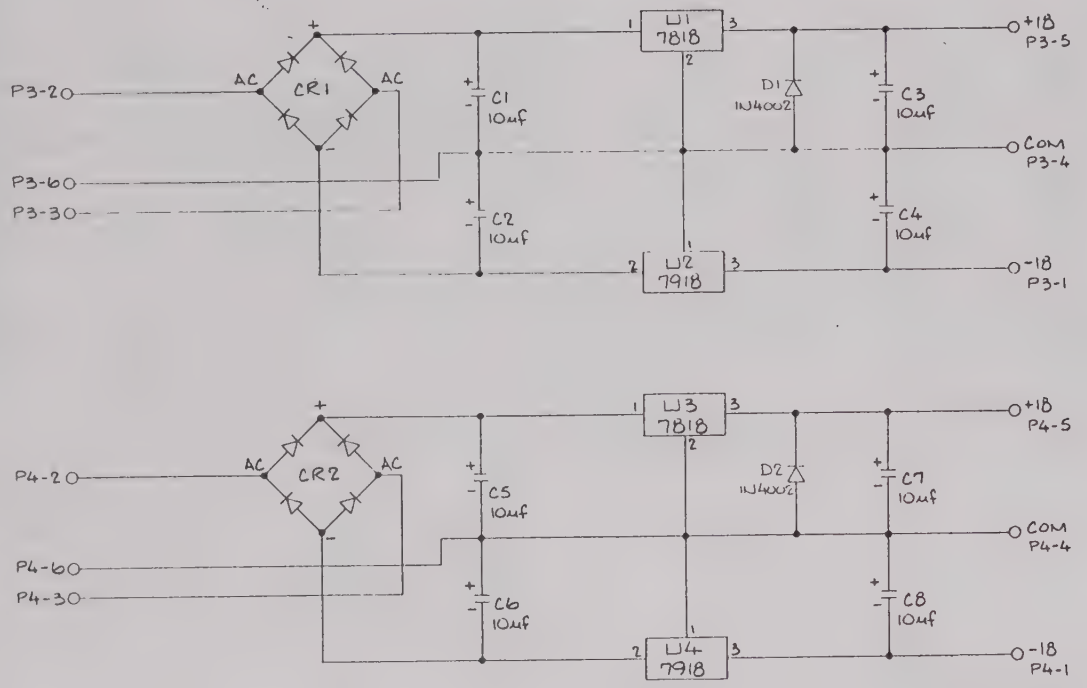


		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/64 DECIMALS ±.005 ANGLES ±0°30' ALL SURFACES 63 REMOVE BURRS AND SHARP EDGES	SIGNATURES	DATE	ASTRO-MED DIVISION ASTRO-TECH INDUSTRIES, INC.
			DWN MSTG	2-2-81	
			CHK		ASSY, POWER SUPPLY BOARD
			ENG		
	D000414		MFG		
D000412	DASH 2 MOD 3	MAT'L —	APP	2-23-81	
NEXT ASSY	USED ON		ISSUED	2-25-81	SIZE C CODE IDENT NO 7 30614001 REV C
APPLICATION		FINISH —	SIMILAR TO		SCALE 2:1 SHEET 5 CONT ON SHEET F
DRAWING LEVEL					

M 1008

C000614 DRAWING NO — B REV

REVISIONS					
ZONE	CHG LTR	DESCRIPTION	CHK BY & DATE	APP BY & DATE
	A-B	N/C UPDATE 5794		



TOP LEVEL SCHEMATIC 40409000

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ON FRACTIONS ± 1/64, DECIMALS ± .005, ANGLES ± 0° 30'. ALL SURFACES REMOVE BURRS AND SHARP EDGES	SIGNATURES	DATE	ASTRO-MED DIVISION ATLAS-YOU INDUSTRIES, INC.	
	DWN MSTG	1-30-81	SCHEMATIC POWER SUPPLY BOARD	
	CHK			
	ENG			
	MFG			
DASH 2 MOD 3	APP TG	3 2 81		
MAT'L —	ISSUED BY	5/5/81	SIZE C — CODE IDENT NO — 3061400X — REV B	
FINISH —	SIMILAR TO —		SCALE — SHEET 1 CONT ON SHEET 2	
NEXT ASSY USED ON APPLICATION DRAWING LEVEL				

3061400X

C000614 DRAWING NO | B REV

REVISIONS					
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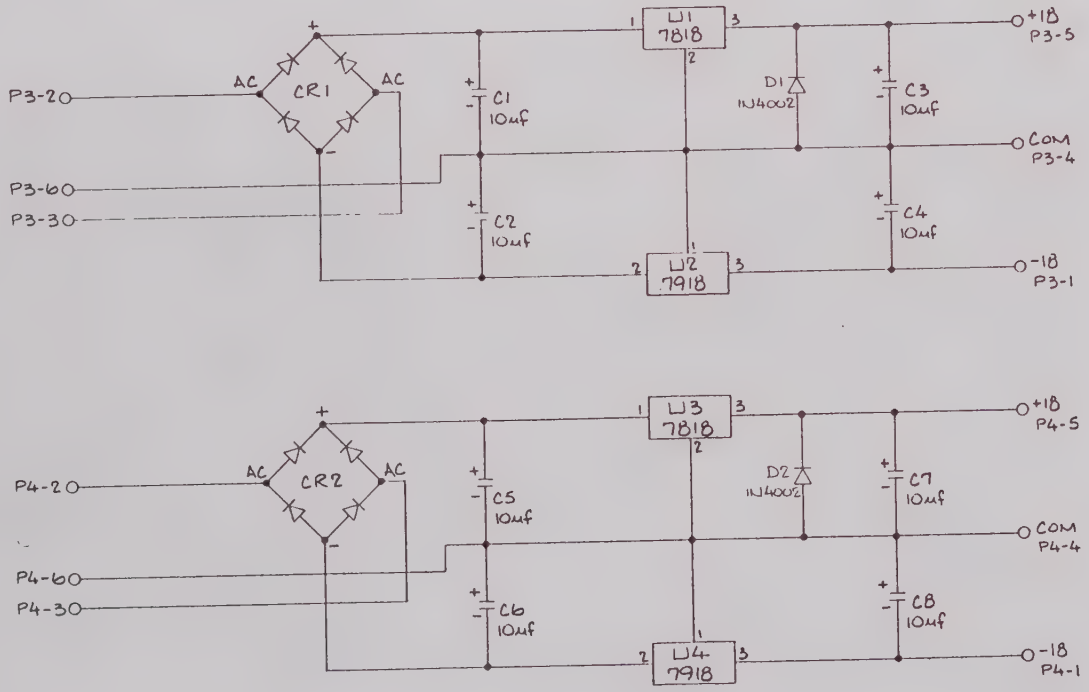
	A B	N/C UPDATE	5794		

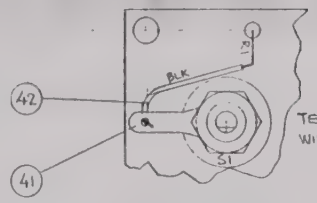


TOP LEVEL SCHEMATIC 40409000

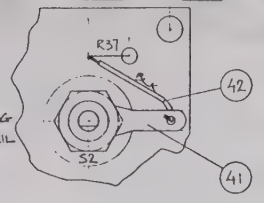
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/64 DECIMALS ±.005 ANGLES ±0°30' ALL SURFACES 63 √ REMOVE BURRS AND SHARP EDGES	SIGNATURES / DATE DWN MSTG 1-30-81 CHK ENG MFG APP DG 2 51 ISSUED 81 5 51	ASTRO-MED DIVISION ASTRO-TOL INDUSTRIES, INC. SCHEMATIC POWER SUPPLY BOARD
	DASH2 MOD3	MAT'L —		SIZE C · CODE IDENT NO · 3061400X · REV B
NEXT ASSY	USED ON	FINISH —	SIMILAR TO	SCALE — · SHEET 1 CONT ON SHEET 2
APPLICATION				
DRAWING LEVEL				

3061400X

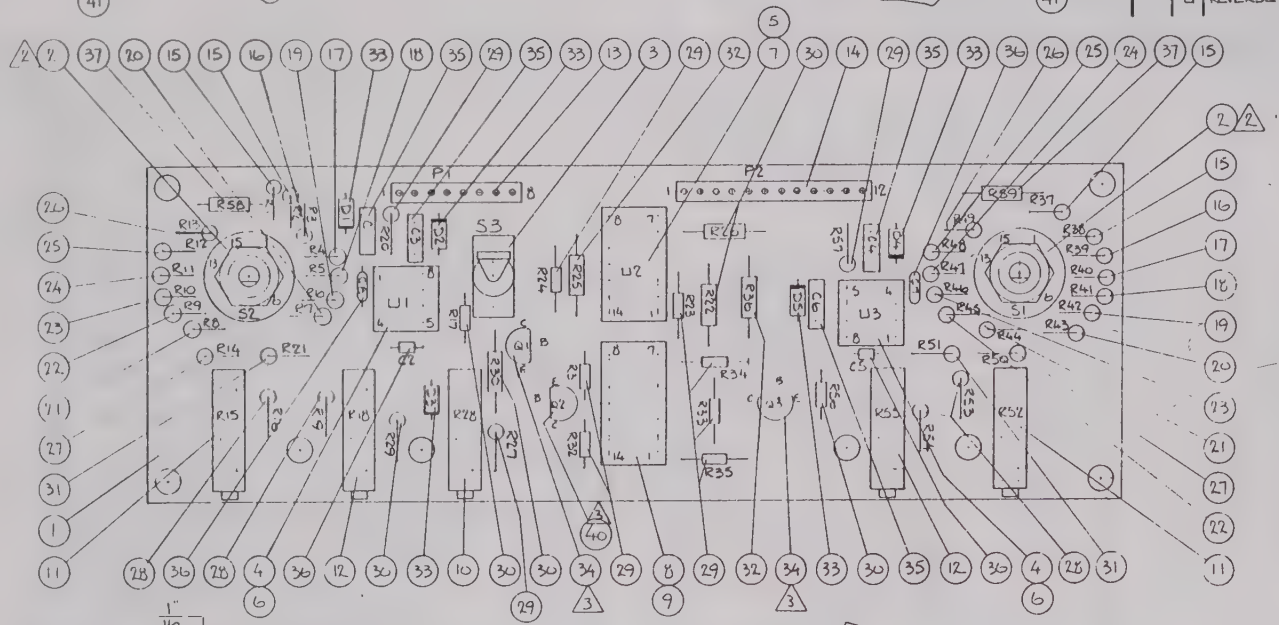
ZONE	CHG LTR	DESCRIPTION	CHG # & DATE	CHKD BY & DATE
	A	-		
	B	ECR 5611 N/C	1/28/81	
	C	ADD R58, R59, C7 AND C8	5794 10-15-81	MSTG
	D	ADD BALLOONS	6244 4-15-82	MSTG
	E	ADD ITEMS 41 & 42	6517 5-25-82	MSTG
	F	REVERSE Q1, Q2, Q3 ADD NOTE 3 ECR 6681	6703 8-25-82	MSTG
	G	REVERSE R13 & R49 MOUNTING	6901	

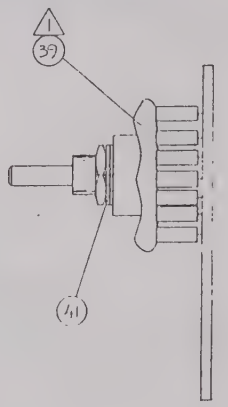


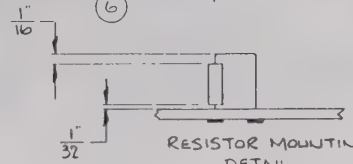
TERMINAL LUG WIRING DETAIL



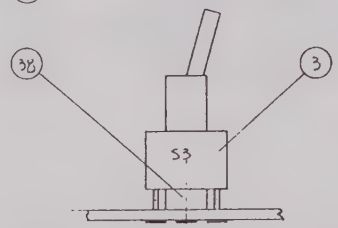
TERMINAL LUG WIRING DETAIL







RESISTOR MOUNTING DETAIL
R1-R14, R16, R17, R19-R21
R27, R27, R29, R37-R51,
R53, R54, R57



TOGGLE SWITCH MOUNTING DETAIL

3 IF TRANSISTOR IS A 2N2222 OR 2N2907, INSTALL OPPOSITE WHAT IS SHOWN. IF 2N2222 OR 2N2907 INSTALL SAME AS IS. IF CAN 2N2907, INSTALL OPPOSITE TAB ON CAN IS EMITTER.

2 THESE SWITCHES MUST BE MOUNTED PERPENDICULAR TO BOARD. (USE FIXTURE)

1 PLACE A BEAD OF SILICONE RUBBER AROUND RESISTORS R1 THRU R13 AND RESISTORS R37 THRU R49 AFTER INSPECTION.

NOTE:

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/64 DECIMALS ±.005 ANGLES ±0°30' ALL SURFACES 63 REMOVE BURRS AND SHARP EDGES	SIGNATURES	DATE
			DWN MSTG	1-8-81
			CHK	
			ENG	
	D000414		MFG	
D000412	DASH 2 MOD 3	MAT'L —	APP DC	2-25-81
NEXT ASSY	USED ON		ISSUED	3/5/81
APPLICATION		FINISH —	SIMILAR TO	
DRAWING LEVEL				

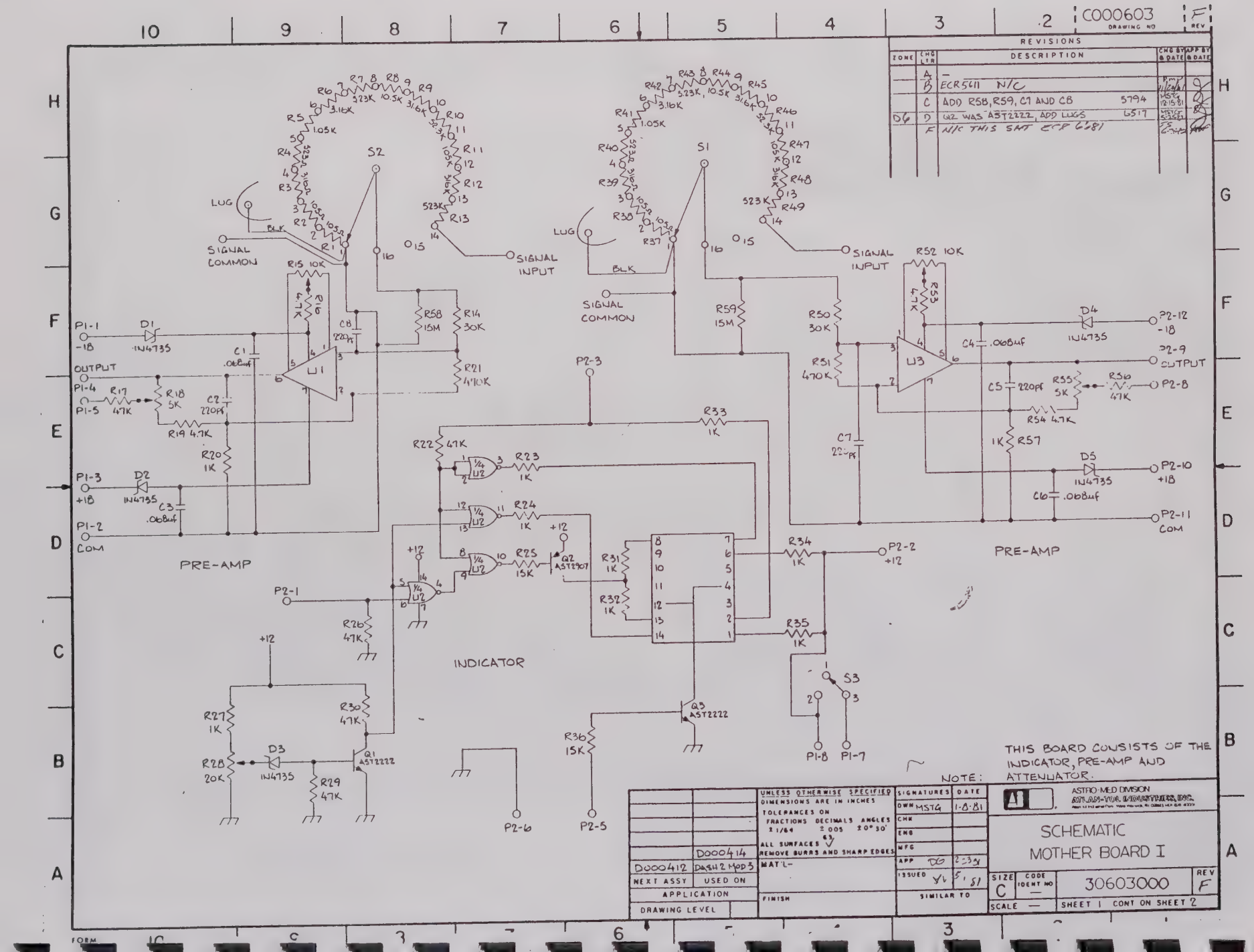
ASTRO MED DIVISION
ASTRO-TOOL INDUSTRIES, INC.

ASSY
MOTHER BOARD I

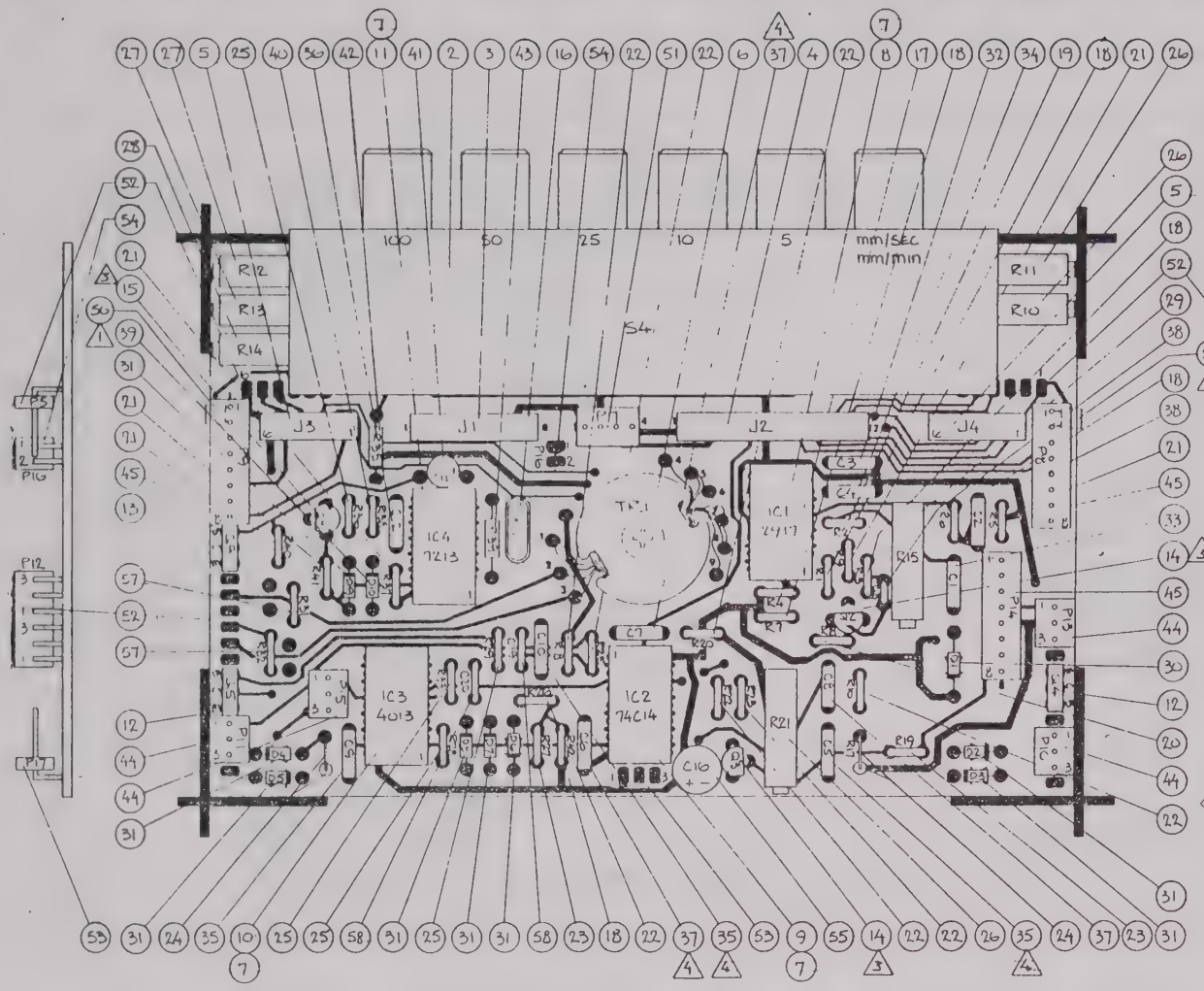
SIZE	CODE IDENT NO		REV
C	7	30603000	G

SCALE 2:1 SHEET 4 CONT ON SHEET F

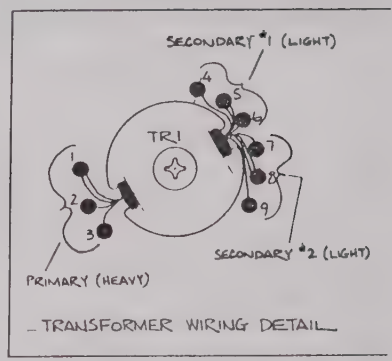
FORM 1009


C000603
DRAWING NO
F
REV
REVISIONS
ZONE
CHG LTR
DESCRIPTION
CHG BY & DATE
APP BY & DATE
A -
B ECR 5611 N/C
C ADD R58, R59, C7 AND C8 5794
D G D2 WAS AST2222, ADD LUGS G517
F N/C THIS SHT ECP 6281
S1
S2
S3
LUG
BLK
SIGNAL COMMON
SIGNAL INPUT
R1 523K
R2 105K
R3 31.6K
R4 523K
R5 1.05K
R6 3.16K
R7 323K
R8 10.5K
R9 31.6K
R10 10.5K
R11 3.16K
R12 523K
R13 14
R14 30K
R15 10K
R21 4.10K
R37 105K
R38 31.6K
R39 523K
R40 105K
R41 1.05K
R42 5.23K
R43 10.5K
R44 31.6K
R45 10.5K
R46 3.16K
R47 523K
R48 10.5K
R49 14
R50 30K
R51 470K
R52 10K
R53 4.70K
R54 4.7K
R55 5K
R56 47K
R57 1K
R58 15M
R59 15M
C1 .068uf
C2 220pf
C3 .068uf
C4 .068uf
C5 220pf
C6 .068uf
C7 220pf
C8 220pf
D1 IN4735
D2 IN4735
D3 IN4735
D4 IN4735
D5 IN4735
U1
U2
U3
Q1 AST2222
Q2 AST2907
Q3 AST2222
P1-1 -18
P1-2 COM
P1-3 +18
P1-4
P1-5
P1-7
P1-8
P2-1
P2-2 +12
P2-3
P2-5
P2-6
P2-8
P2-9 OUTPUT
P2-10 +18
P2-11 COM
P2-12 -18
OUTPUT
PRE-AMP
PRE-AMP
INDICATOR
R17 47K
R18 5K
R19 4.7K
R20 1K
R22 47K
R23 1K
R24 1K
R25 15K
R26 47K
R27 1K
R28 20K
R29 47K
R30 47K
R31 1K
R32 1K
R33 1K
R34 1K
R35 1K
R36 15K
+12
NOTE: THIS BOARD CONSISTS OF THE INDICATOR, PRE-AMP AND ATTENUATOR.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS DECIMALS ANGLES ±1/64 ±.005 ±0°30'
ALL SURFACES REMOVE BURRS AND SHARP EDGES
MAT'L-
FINISH
D000414
D000412 DASH 2 MOD 3
NEXT ASSY USED ON
APPLICATION
DRAWING LEVEL
SIGNATURES DATE
DWN MSTG 1-8-81
CHK
ENG
MFG
APP DG 2-3-81
ISSUED 5/1/81
SIMILAR TO
ASTRO-MED DIVISION
ASTRO-TOOL MOUNTAINEER, INC.
SCHEMATIC
MOTHER BOARD I
SIZE C
CODE IDENT NO —
30603000
REV F
SCALE —
SHEET 1 CONT ON SHEET 2

B	REDRAW	5794	
C	SPACE RIGHT ANGLE CONNECTORS 1/16 FROM BOARD.	5932	
D	ADD BALLOONS.	6268	
E	ADD ITEM 56 AND NOTE 1	6244	
F	REMOVE (4) ITEM 23, (2) ITEM 35, ADD ITEM 57 & 58	6576	
G	ADD TRANS. WIRING DETAIL AND NOTE 4	7363	



1/16 TYPICAL ALL RIGHT ANGLE CONNECTORS



TRANSFORMER WIRING DETAIL

COMPONENT SIDE

4 PLACE YELLOW TAPE UNDER C5, C6, C7 & C10

3 IF TRANSISTOR IS A AST2222 OR A AST2907, INSTALL OPPOSITE WHAT IS SHOWN. IF IT IS A ABT2222 OR A ABT2907 INSTALL SAME AS WHAT IS SHOWN. IF METAL CAN AT2907 (QB ONLY) INSTALL OPP PATTERN, TAB ON CAN IS EMITTER.

2 FOR SCHEMATIC SEE 40425000.

1 ITEM 56 TO BE MOUNTED ON OPPOSITE SIDE OF BOARD AS SHOWN.

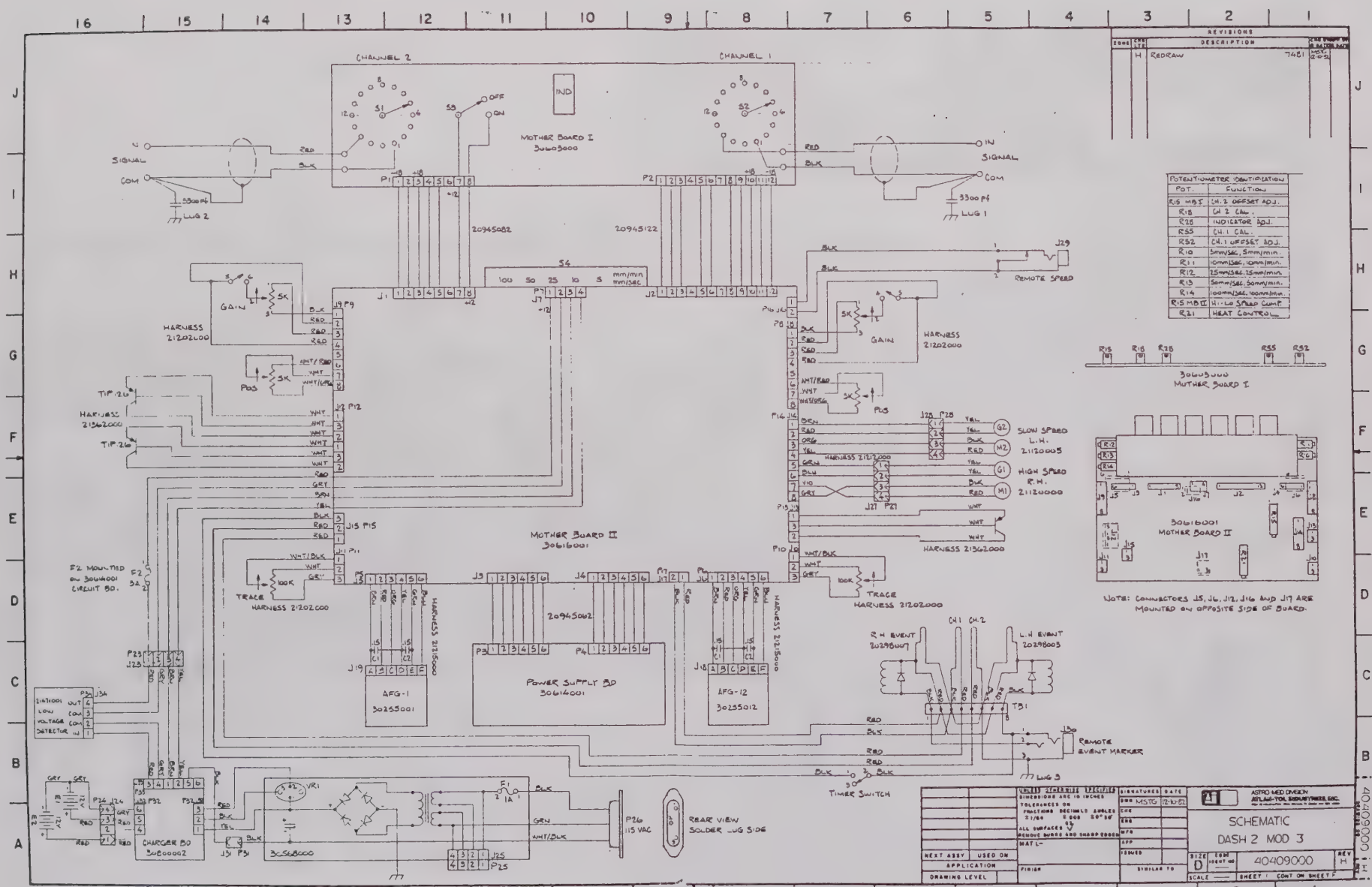
NOTE:

		DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± 1/64 ± .005 ±0°30' ALL SURFACES 63 REMOVE BURRS AND SHARP EDGES	SIGNATURES / DATE DWN MST4 12-10-87 CHK ENG MFG APP ISSUED 12/29/87
D000412	D000414	DASH II MOD	MAT'L -
NEXT ASSY	USED ON		FINISH
APPLICATION			SIMILAR TO
DRAWING LEVEL			

ASTRO-MED DIVISION
ATLAS-TOOL INDUSTRIES, INC.

ASSY
MOTHER BOARD II

SIZE	CODE IDENT NO		REV
C	07103	30616001	G
SCALE 2:1		SHEET 4 CONT ON SHEET F	



REVISIONS			
ZONE	LTR	DESCRIPTION	DATE / APPROVED
	H	REDRAW	7481

POTENTIOMETER IDENTIFICATION	
POT.	FUNCTION
R15 MB I	CH. 2 OFFSET ADJ.
R16	CH 2 CAL.
R26	INDICATOR ADJ.
R55	CH. 1 CAL.
R52	CH. 1 OFFSET ADJ.
R10	5mm/SEC, 5mm/min.
R11	10mm/SEC, 10mm/min.
R12	25mm/SEC, 25mm/min.
R13	50mm/SEC, 50mm/min.
R14	100mm/SEC, 100mm/min.
R15 MB II	HI-LO SPEED COMP.
R21	HEAT CONTROL

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ON FRACTIONS ±1/64, DECIMALS .X ±.03, .XX ±.010, ANGLES ±0°30'. ALL SURFACES TO REMOVE BURRS AND SHARP EDGES. MATL- FINISH		SIGNATURES	DATE
		DRN MSTG	12-17-82
		CHK	
		ENG	
		MFG	
		APP	
		ISSUED	
NEXT ASSY USED ON		SIMILAR TO	
APPLICATION			
DRAWING LEVEL			

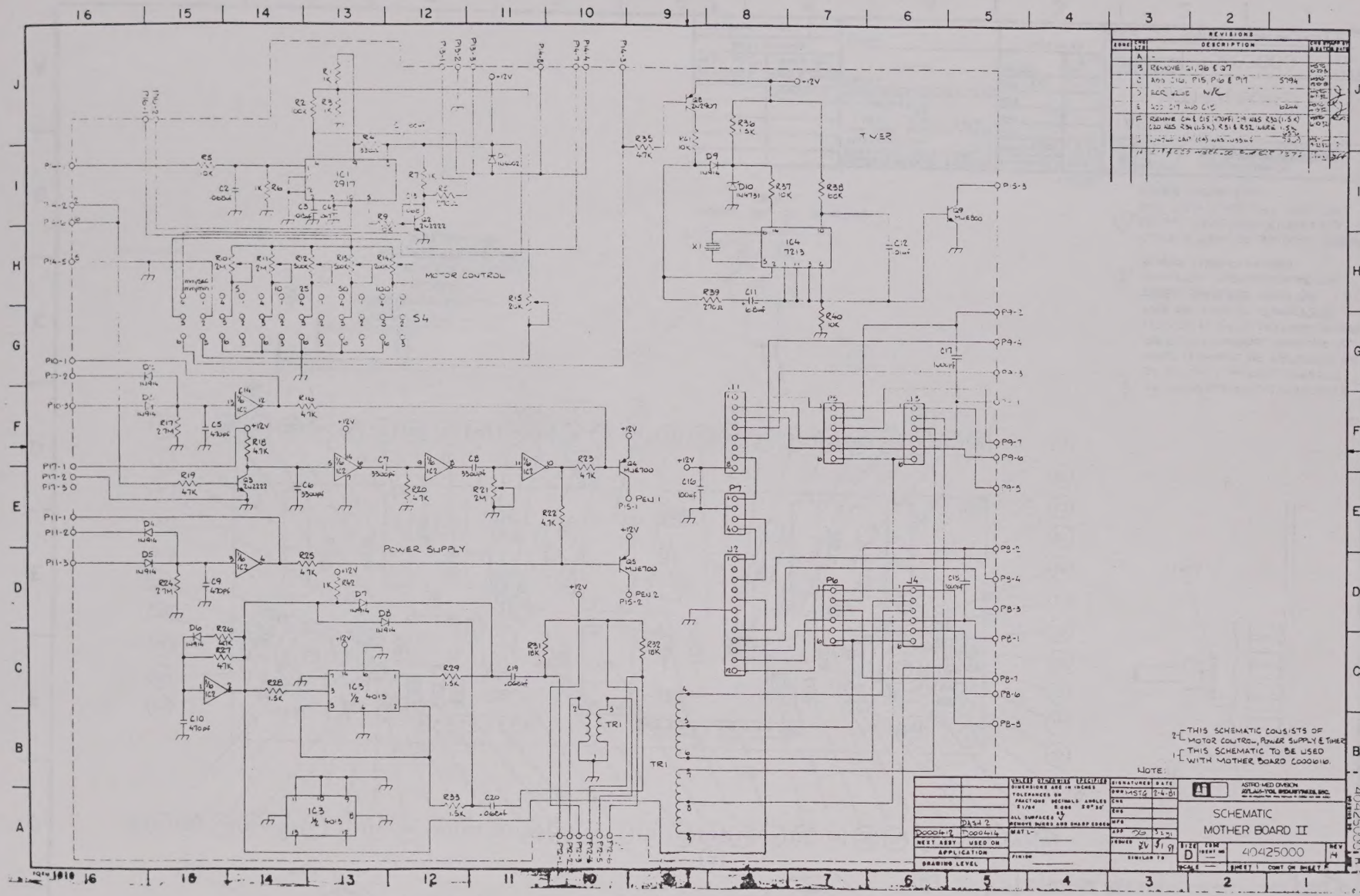
ASTRO-MED DIVISION
ASTRO-TECH INDUSTRIES, INC.

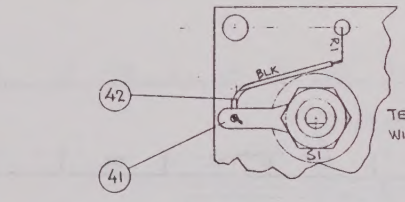
SCHEMATIC
DASH 2 MOD 3

SIZE	CODE IDENT NO	DRAWING NO	REV
D		404090000	H

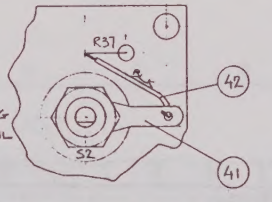
SCALE — SHEET 1 CONT ON SHEET 2

404090000 H


MOTOR CONTROL
POWER SUPPLY
TVER
S4
TR1
IC1 2917
IC2 4066
IC3 ½ 4013
IC4 7213
Q1 2N2907
Q2 2N2222
Q3 2N2222
Q4 MJE800
Q5 MJE700
Q6 MJE700
Q7 2N2907
Q8 2N2907
Q9 MJE800
D1 1N4148
D2 1N4148
D3 1N4148
D4 1N4148
D5 1N4148
D6 1N4148
D7 1N4148
D8 1N4148
D9 1N4148
D10 1N4731
P1
P2
P3
P4
P5
P6
P7
P8
P9
P10
P11
P12
P13
P14
P15
P16
P17
J1
J2
J3
J4
J5
+12V
0+12V
PEN 1
PEN 2
P15-1
P15-2
C1 .1µf
C2 .0068µf
C3 .015µf
C4 .047µf
C5 .0047µf
C6 330pf
C7 330pf
C8 330pf
C9 .0047µf
C10 470pf
C11 .68µf
C12 .01µf
C13 .0068µf
C14 .0047µf
C15 .0047µf
C16 100µf
C17 100µf
C18 .0068µf
C19 .0068µf
C20 .0068µf
R1 10K
R2 100K
R3 1K
R4 330Ω
R5 10K
R6 1K
R7 1K
R8 2.7K
R9 100Ω
R10 2M
R11 2M
R12 500K
R13 500K
R14 2M
R15 2M
R16 47K
R17 2.7M
R18 47K
R19 47K
R20 47K
R21 2M
R22 47K
R23 47K
R24 2.7M
R25 47K
R26 47K
R27 47K
R28 1.5K
R29 1.5K
R30 1K
R31 15K
R32 10K
R33 1.5K
R34 10K
R35 47K
R36 1.5K
R37 10K
R38 100K
R39 270Ω
R40 10K
X1
NOTE:
2 THIS SCHEMATIC CONSISTS OF MOTOR CONTROL, POWER SUPPLY & TIMER
1 THIS SCHEMATIC TO BE USED WITH MOTHER BOARD C000610.
REVISIONS
DESCRIPTION
SCHEMATIC
MOTHER BOARD II
ASTRO-MED DIVISION
ASTRO-TOL INDUSTRIES, INC.
40425000
SIZE D
SHEET 1 CONT ON SHEET 2
NEXT ASSY
USED ON
APPLICATION
DRAWING LEVEL
D000412
D000414
D234-2
DRAWN 2V 31 81
DRWMSTR 2-4-81



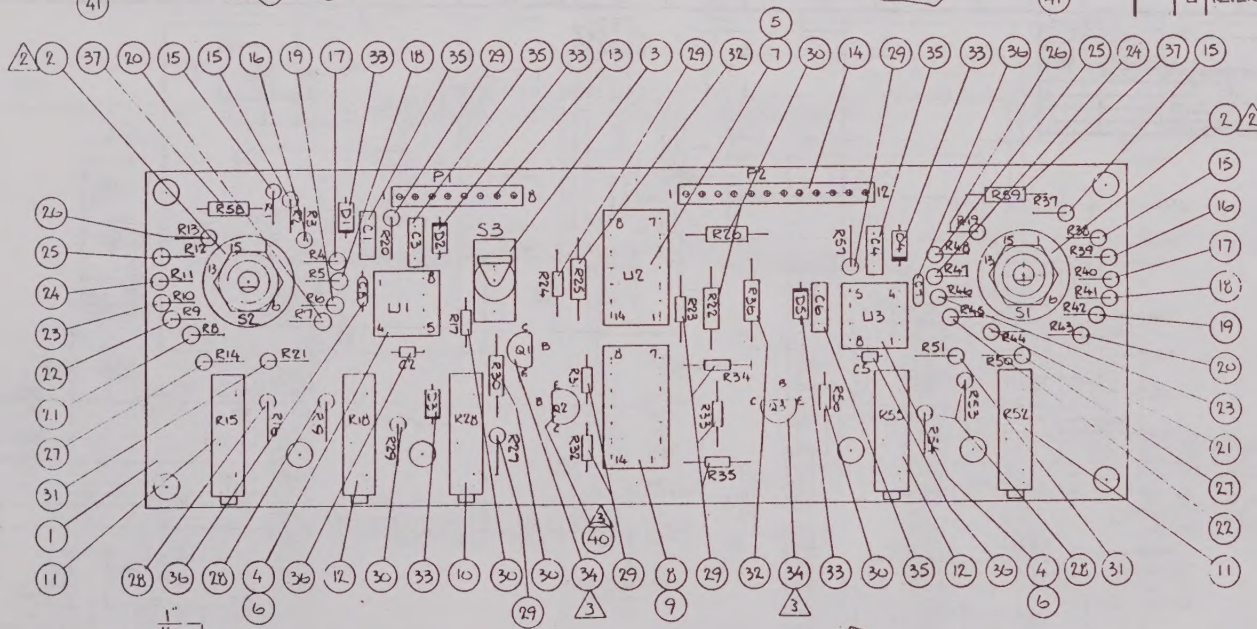
TERMINAL LUG WIRING DETAIL

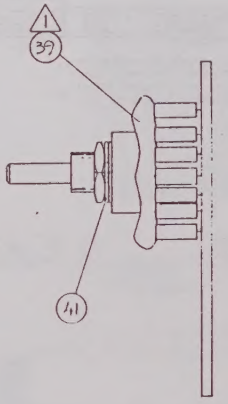


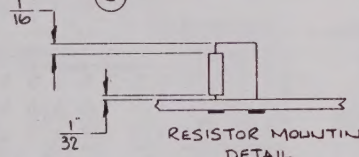
TERMINAL LUG WIRING DETAIL

REVISIONS

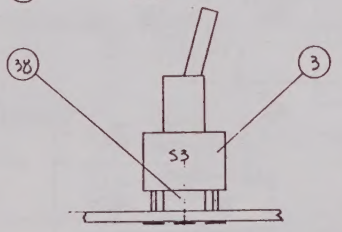
ZONE	CHG LTR	DESCRIPTION	CHG # & DATE	APP'D BY & DATE
	A	–		
	B	ECR 5611 N/C	5611 4/28/81	MSTG 4/28/81
	C	ADD R58, R59, C7 AND C8	5798	MSTG 12-15-81
	D	ADD BALLOONS	6244	MSTG 4-15-82
	E	ADD ITEMS 41 & 42	6617	MSTG 5-25-82
	F	REVERSE Q1, Q2, Q3 ADD NOTE 3 ECR 6691	6691	MSTG 7-15-82
	G	REVERSE R13 & R49 MOUNTING	6901	MSTG 7-25-82







RESISTOR MOUNTING DETAIL
R1-R14, R16, R17, R19-R21
R27, R27, R29, R37-R51,
R53, R54, R57



TOGGLE SWITCH MOUNTING DETAIL

3 – IF TRANSISTOR IS A AST2222 OR AST2907, INSTALL OPPOSITE WHAT IS SHOWN. IF AST2222 OR AST2907 INSTALL SAME AS IS. IF CAN ST2907, INSTALL OPPOSITE TAB ON CAN IS EMITTER.

2 – THESE SWITCHES MUST BE MOUNTED PERPENDICULAR TO BOARD. (USE FIXTURE)

1 – PLACE A BEAD OF SILICONE RUBBER AROUND RESISTORS R1 THRU R13 AND RESISTORS R37 THRU R49 AFTER INSPECTION.

NOTE:

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/64 DECIMALS .005 ANGLES ±0°30' ALL SURFACES 63 REMOVE BURRS AND SHARP EDGES	SIGNATURES	DATE
			DWN MSTG	1-8-81
			CHK	
			ENG	
	D000414		MFG	
D000412	DASH 2 MOD 3	MAT'L –	APP DC	2-25-81
NEXT ASSY	USED ON		ISSUED	3/1/81
APPLICATION		FINISH –	SIMILAR TO	
DRAWING LEVEL				

ASTRO-MED DIVISION
ASTRO-TOL INDUSTRIES, INC.

ASSY
MOTHER BOARD I

SIZE	CODE IDENT NO	30603000	REV
C	7		G

SCALE 2=1 SHEET 4 CONT ON SHEET F

FORM 1008

82386